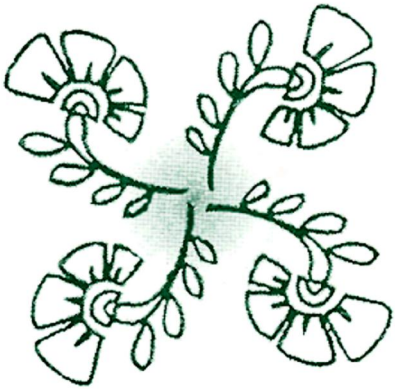
BALTIC BOTANIC GARDENS

IN 2007 – 2008

ESTONIA LATVIA LITHUANIA



RĪGA, LATVIA
2009

BALTIC BOTANIC GARDENS
IN 2007 – 2008

ESTONIA LATVIA LITHUANIA

Rīga, Latvia

2009

The periodical issue of Baltic Botanic Gardens includes information about main events in the Botanical Gardens in Estonia, Latvia and Lithuania in 2007 – 2008. It contains 15 scientific articles about collections of Botanical Gardens.

Authors themselves are responsible for content of papers.

Editor:
Dr.biol Signe Tomsone

Technical editor:
Lauma Strazdiņa

Botanical Garden of the University of Latvia
2, Kandavas Str.
LV 1083, Rīga
LATVIA

CONTENTS

REPORT OF DEVELOPMENT

TALLIN BOTANIC GARDEN

Period: 2007-2008

Address	Kloostrimetsa Road 52, Tallinn, Estonia 11913
Phone	+ 372 6062679
Fax	+372 6005529
e-mail	aed@tba.ee
www	www.tba.ee
Director	Margus Kingisepp
Territory area	65 ha

STRUCTURE AND STAFF

	2007	2008
Administration	3	3
Dept. of Environmental Education	11	12
Dept. of Outdoor Collections	12	13
Dept. of Tropical and Subtropical Collections	11	11
Marketing and Sales Dept.	6	5
Technical Dept.	5	5
TOTAL including:	48	49
PhD	3	3
Msc	3	3

FINANCES (in *EUR*)

	2007	2008
Income		
Revenue	141 000	133 500
Targeted financing	37 400	21 660
TOTAL	178 400	155 160
Expenses		
Operational expenditure	429 730	460 700
Salaries	350 870	402 000
TOTAL	780 600	862 700
Educational nature programmes for students		
Targeted financing	28 120	32 000

LIVING PLANT COLLECTIONS

Total No of taxa: **5500**

Main taxa	No. of taxa
Indoor plants, including:	2150
Succulent plants	840
Tropical plants	600
Subtropical plants	366
Tropical orchids and cymbidiums	344
Trees and shrubs	1600
Roses	655
Herbaceous plants, including:	3770
Bulbous plants	1500
Ornamental grasses	155
Mountain plants	654
Peonies	326
Irises	196
Useful plants	246
Tall perennials	349
Other perennials	344

Herbarium

No. of specimens: 86300

THE MAIN ACTIVITIES

In 2007 the reconstruction project of the greenhouses of the Tallinn Botanic Garden began, starting with the reconstruction of the Southern wing of the greenhouse complex. The project was financed from European Union Structural Funds through Enterprise Estonia, self-finance was provided by the City of Tallinn. The first stage is due to be ready in 2009. The new subtropical exposition will include Australian, Chinese-Japanese and Mediterranean collections.

A project for schoolchildren - nature study combined with traditional school programmes has been carried through since 2006. To allow appropriate working conditions for the participants, the reconstruction of an older wooden house started in 2006. The work was completed in December 2008. There are two untraditional classrooms for indoor studies, a library, a laboratory and rooms for the teachers in the house. The project is popular among the schools in Tallinn. 1274 pupils participated in our nature study project in 2007. In 2008 the number was already 1731.

There were 28000 visitors in the greenhouse expositions of the Tallinn Botanic Garden in 2007, and 30300 visitors in 2008.

SCIENTIFIC ACTIVITIES

The basic directions of current research activities in Tallinn Botanic Garden:

- The study of ecology, population and reproductive biology of threatened plant species with the aim of recovery/restoration of their natural populations by combined ex situ and in situ methods (plant conservation oriented research:
- The reintroduction experiment of /Woodsia ilvensis/ (L.) R.Br. and population enhancement of /Asplenium septentrionale/ (L.) Hoffm.
- The ecological recovery of critically endangered fern lineage /Diellia/ Brack. (Aspleniaceae) in collaboration with National Tropical Botanical Garden, Kauai, Hawaiian Islands.
- The fern spore bank as a source for the recovery of the species and indicator for possible changes in the natural community.
- The long-term projects of inventories and surveys (introduction projects, long-term observations and inventories of historical parks etc.).
- Plant physiology: The eco-physiological reactions of trees to abiotic stress factors (Helen Kösta, PhD. stud. at Estonian University of Life Sciences).

Environmental monitoring:

- Spatial and temporal trends in heavy metal accumulation in mosses in Estonia. Participation in the United Nations Economic Commission for Europe International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops (UNECE ICP Vegetation) "Heavy Metals in European Mosses". It is one of seven ICPs and task Forces that report to the Working Group on Effects of Long-Range Transboundary Air Pollution (LRTAP) Convention on the effects of atmospheric pollutants on different compounds of the environment and health. (Siiri Liiv, PhD).
- Monitoring of cliff forest plant communities (Olev Abner).
- Monitoring of threatened vascular plant species of Estonia. (Ruth Aguraiuja, PhD).

BOTANICAL GARDEN OF THE UNIVERSITY OF TARTU

Period: 2007-2008

Address	38, Lai Str., 51005 Tartu, Estonia
Phone	+372 737 6180
Fax	+372 737 6218
e-mail	botaed@ut.ee
www	http://www.ut.ee/botaed
Director	Mr. Heiki Tamm, PhD
Territory area	3,5 + 0,5 = 4,0 ha

STRUCTURE AND STAFF

	2007	2008
Administration	3	3,5
Researcher	1	1
Gardeners	7	7
Other	3	3
TOTAL including:	14	14,5
PhD	1	1
Msc	2	2

FINANCES (in EEK/ *EUR*)

	2007	2008
Income		
University funding	3 575 800/ 229 230	4 634 500/ 297 080
Research projects	640 000/ 41 025	696 100/ 44 620
Other	488 500/ 30 900	383 700/ 24 600
TOTAL	4 704 300/ 301 155	5 714 300/ 366 300
Expenses		
Salaries	2 231 200/ 148 200	2 561 100/ 164 180
Explotation of rooms	1 443 200/ 92 510	2 073 100/ 132 890
Other	1 043 800/ 61 730	1 192 200/ 76 410
TOTAL	4 718 200/ 302 440	5 826 400/ 373 480

LIVING PLANT COLLECTIONS

Total No of taxa: **6500**

Main taxa	No. of taxons
Indoor plants, including:	1200
Succulents	450
Palms	68
Trees and shrubs, including:	700
Roses	250
Maples	19
Herbaceous plants, including:	4600
Paeonies	260
Medicinal plants	200
Clematis	60
Iris	60

High diversity of plants in collections at the area of 3,5 ha was developed during centuries by famous botanists G.A. Germann, C. F. Ledebour, A.v. Bunge, I. Kuznetsov, T. Lippmaa. A. Vaga, J. Palumets , etc. During last years the new collctions of *Paeonia* (opened in 2005), *Clematis* (opened in 2007) and the Medicinal Plants (opened in 2007) were added. The new testing and reproduction garden of 0, 5 ha was laid out (in 2007-2008). A very rare and endemic plant of Australia – *Wollemia nobilis*- was given us by the Ambassador of Australia in Nordic and Baltic countries.

Library:

500 volumes

THE MAIN ACTIVITIES

In 2007:

The building of the new testing and **reproduction garden** of 0,5 ha at Oa Str. was continued. The construction of two greenhouses (210 and 73 m^2) for subtropical and tropical plant reproduction, and the working rooms for gardeners (61 m^2) were finished. The new plastic greenhouse of 208 m^2 was built for the growing of young plants of the temperate zone. The new beds of medicinal plants of 200 species were laid out for the students of pharmacy education. **Conservation beds** for rare and valuable taxa of ornamental plants (*Clematis* cultivars of 50 taxa, bred in Estonia) and 50 species of medicinal plants were planted.

The 300th anniversary of birth of Carl v. Linne was celebrated and a memorial apple tree *Malus* `Linne Apple` was planted.

Education: 1841 students of the University of Tartu, the University of Life Sciences and of the Räpina Gardening School passed different courses in the botanical garden. 20 408 visitors were properly interested in all plant collections and booked more than 196 guided tours. The thematic days for public on plant systematic and on *Clematis* gardening were organized.

Recreation and cultural events: More than 109 800 visitors used the park area for recreation and cultural events. Different exhibitions (8), concerts (5) were organized.

In 2008:

The Garden celebrated its 205th anniversary. Two regional seminars were organized and a new illuminated garden pavilion in classical style was constructed at the pond island. The Arboretum was digitally mapped and more than 1000 tree specimen were revised. The list of tree species and the map of tree locations were compiled. The new displays of *Opuntia* (13 taxa) and *Primula* (63 taxa) were laid out at the Rock Garden. The working room of 6 gardeners was renovated. The new compost ground was built.

Education:

1285 students of the University of Tartu, the University of Life Sciences and the Räpina Gardening School passed 30 different courses and training in the botanical garden. More than 20 250 visitors were properly interested in all plant collections and 157 guided tours were booked. The thematic days and exhibitions on palms, grasses and wood decaying fungi were organized for public. A special workshop for the city guides was organized.

Recreation and cultural events:

More than 130 500 visitors used the park area for recreation and cultural events. Different concerts (5), photo and painting exhibitions (9) and two plays were exposed and performed at the summer stage, the visitor centre and the palm house.

SCIENTIFIC ACTIVITIES

In 2007

The research of genetic resources of ornamental and medicinal plants of Estonia was continued and results of the research were presented in different **scientific conferences:**

- O. Volkova. Medicinal and aromatic plants in Estonia. Third Meeting of the ECPGR Medicinal and Aromatic Plants Working Group. Olomouc, 26-28.06.2007.
- O. Volkova, A. Raal. Genetic resources of medicinal and aromatic plants in Estonia with research of native population of *Thymus serpyllum* L. Third

Meeting of the ECGPR Medicinal and Aromatic Plants Working Group. Oleomouc, 26-28.06.2007

- O. Volkova, J. Sild, H. Tamm. Conservation of ornamental and medicinal plants in botanic garsdens of Estonia. 2nd International Conference of Eastern and Central European Botanic Gardens. Warsaw, 3-6.07.2007.
- H. Tamm. Conservation of palnts in Estonia. 3rd Global Botanic Gardens Congress. Wuhan, 16-20.04.2007
- H. Tamm. Plant conservation in Estonia. Conference of American Public Gardens Association. Washington, 26-30.06.2007.

Publications:

- Index Seminum anno 2007 collectorum quae Hortus Botanicus Universitatis Tartuensis pro mutua commutatione offert. Tartu, 2007, 27 p (seed of 694 species).
- H. Tamm. Flora and vegetation. Almanac of Estonian Parks. Ministry of Environment. Tallinn, 2007, p. 92-97.
- H. Tamm. Conservation of plants in botanic gardens Estonia. 3 GBGC>Proceedings. Online: http://www.bgci.org/wuhan/home, 3 p.
- O. Volkova, J. Sild, H. Tamm. Conservation of ornamental and medicinal plants in botanic gardens of Estonia. Program & Abstracts, EastCentGard II. Bulletin of Botanic Gardens, Museums & Collections, vol.16A. Warsaw, 2007, p.44.

In 2008

Plant conservation **research** was carried out in co-operation with the Botanical Department of the Institute of Ecology and Earth Sciences, and young plants of endangered *Dianthus superbus* were replanted back to nature. 40 rare species were planted at the display ground of native flora in the garden.

The results of research were reported at the **international conferences and seminars.**

Organizing of conferences:

Two regional workshops which were devoted to the 205th anniversary of the garden were organized**:**

- Databases and seed exchange in botanic gardens. Tartu, March 20-21,2008 (22 participants of 4 countries). In cooperation with the European Botanic Garden Consortium.
- Geoinfosystem (GIS) in Botanic Gardens. Tartu, November 2, 2008 (13 participants of 2 coutries).

H. Tamm – the member of the organizing committee of the EUROGARD V and responsible for post congress tour to Estonia.

Reports:

Ŏ J. Sild. Data base of the Botanical Garden of the University of Tartu. Workshop "Databases and seed exchange in botanic gardens". Tartu, March 21-22, 2008.

Ŏ K. Tambets. Seed exchange of the Botanical Garden of the University of Tartu. Tartu, March 21-22, 2008.

Ŏ E.-K. Uibo, J. Sild. Geoinfosystem (GIS) in the Botanical Garden of the University of Tartu. Workshop "Geoinfosystem (GIS) in Botanical Gardens". Tartu, November 21, 2008.

Ŏ H. Tamm. Global strategy for plant conservation: Target VIII and IX. Meeting of botanic gardens around the Baltic Sea.. Visby, September 10-12, 2008.

Ŏ H. Tamm. Plant survival in the old parks – plant communities. International conference "Parks in the 21th century of the eastern Europe. Tartu-Viljandi, October 01-05, 2008.

Ŏ H. Tamm. Network of botanic gardens of the Baltic coutries – an historical approach. Meeting of the Association of Baltic Botanic Gardens. Riga, November 21, 2008.

Publications:

Ŏ Index Seminum anno 2008 collectorum quae Hortus Botanicus Universitatis Tartuensis pro mutual commutation offert. Tartu, 2008, 47 p.

Ŏ E.-K. Uibo. Arboretum of the Botanical Garden of the University of Tartu. Tartu, 2008, 47 p.

Ŏ H. Tamm. Plant survival in the old parks – plant communities. – The Estonian Park Almanac, 7 p. + 4 photographs. (manuscript at the publisher).

BOTANICAL GARDEN OF THE UNIVERSITY OF LATVIA

Period: 2007-2008

Address	Kandavas str. 2, Riga, LV-1083, Latvia
Phone	+371 67450852
Fax	+371 67450852
e-mail	botdarzs@lanet.lv
www	www.botanika.lv
Director	Anta Sparinska
Territory area	15 ha

STRUCTURE AND STAFF

	2007	2008
Administration	4	4
Researchers	6	9
Gardeners	20	20
Technical staff	12	12
TOTAL including:	42	45
PhD	3	4
Msc	4	6

FINANCES (in Lats, *1 Ls = 1,4229 EUR*)

	2007	2008
Income		
University subsidy	169 695	192 609
University subsidy for development	0	50 000
Projects of development	28 855	6 689
Base funding for science	16 499	28 677
Research projects	26 343	6 338
Income (plant, ticket selling, etc.)	43 145	69 868
TOTAL	**284 537**	**354 181**
Expenses		
Salaries (including taxes)	186 667	226 155
Infrastructure maintenance	39 905	56 533
Activities for development (ground hydro-geological investigation, landscape plan, etc.)	48 855	50 000
TOTAL	**275427**	**332 688**

LIVING PLANT COLLECTIONS

Total No of taxa: **5795**

Main taxa	No. of taxons
Indoor plants, including:	**1571**
Succulent plants	714
Tropical plants	349
Subtropical plants	384
Azalea	124
Trees and shrubs, including:	**760**
Rhododendrons	110
Lilacs	72
Magnolias	17
Herbaceous ornamental plants, including:	**2076**
Dahlias	280
Lilies	90
Hostas	100
Systematic groups of plants	**649**
Biological and morphological groups of plants, including:	**719**
Medical plants	286
Poisonous plants	64
Mire plants	**20**

THE MAIN ACTIVITIES

2007

Botanical Garden of the University of Latvia celebrated 85th anniversary since the foundation.

The garden started planned activities for the reconstruction and modernization. The International workshop-competition for architects, landscape architects and urban planners "Botanical Garden of Latvian University – revival and future development" was organized. Six groups of the architects from Finland, Estonia, Germany, Latvia and Belgium took place in the competition. The highest estimation received SALTO architectural office from Estonia. The participants of the workshop have produced good ideas and specific solutions:

- for arrangement of high-quality landscape,
- for reconstruction of the Palm-House and historical buildings,
- an architectural vision of the new objects in the territory,
- for organization of the internal roads and traffic in the territory.

The workshop was supported by the University of Latvia, The Ministry of Education and Sciences of Latvia, Riga City Council and The Latvian Environmental Protection Fund.

2008

Botanical Garden celebrated 80ty years of Greenhouses.
The University of Latvia and the Ministry of Education and Sciences of Latvia supported further activities forwarding the modernization of the Garden:

- sketch design for Science Adventure Centre,
- hydro-geological estimation of the ground,
- creation of the landscape plan,
- architectonic and design inventory for buildings – wooden architecture monuments,
- plan for pond,
- analyze for the traffic, etc.

The Garden's specialists learned tour guiding in the workshop leaded by Julia Willison (BGCI, Great Britain). The workshop was supported by The Latvian Environmental Protection Fund, project "Rising of interpretation quality about biological diversity".
Since 2008 Spring and Autumn Festivities took place in the Garden with the participation of plant growers, dancing, singing and artistic works.

Visitors

Year	2007	2008
People	31122	52205

SCIENTIFIC ACTIVITIES

Projects

Grant supported by the Science Council of Latvia "Development of ecologically grounded various type artificial plant communities of perennials for greenery" (heades by Dr. boil. A. Orehovs, 2007, 2008).
Participation in the scientific projects held by other institutions:

- Project supported by the Science Council of Latvia "The effect of possible dormancy and low temperature on the development and physiology of *in vitro* and *in vivo* plants from family *Ericaceae*" (2007, 2008);
- Biological reason for the conservation of rare and protected plants from the seacoast (2007, 2008);
- Participation in the scientific project supported by the Ministry of Agriculture "Assessment of the risk factors of genetically modified organisms and their influence on environment" (2008).

Publications

2007

Ŏ Latvijas Universitāte Botāniskais dārzs / Botanic Garden University of Latvia, 2007, LU Akadēmiskais apgāds, 40 p. (in Latvian and in English)

2008

Ŏ Orehovs A., Nāburga-Jermakova I. Decorative Ecological Expositions in Botanical Garden of University of Latvia, East Cent Gard II, Varshava, Poland, 03.-07. 2007

Ŏ Index Seminum 75, Rīga, 2008, 18 p.

Conferences

2007

Ŏ Orehovs A., Nāburga-Jermakova I. Decorative Ecological Expositions in Botanical Garden of University of Latvia, East Cent Gard II, Varshava, Poland, 03.-07. 2007.

Ŏ Galeniece Ā. Collection of Magnolia in Botanical garden of the University of Latvia, East Cent Gard II, Varshava, Poland, 03.-07. 2007.

2008

Ŏ Orehovs A. Classification of habituses of perennials according to character of their seasonal dynamics, 2nd World Scientific congress Challenges in Botanical Research and climate Change, Delft, 29.06.- 04.07. 2008

Ŏ Vishnevska L., Galeniece Ā., Grīviņa D., Zilins J. Conifers in the collections of Latvian botanic gardens, 2nd World Scientific congress Challenges in Botanical Research and climate Change, Delft, 29.06.- 04.07. 2008

Ŏ Nāburga-Jermakova I. Existence dynamic of some Latvian plants in long-term artificial plant communities of perennials, 22nd Expedition of the Baltic botanists, Daugavpils University, July 14-17, 2008.

Ŏ Strazdiņa L. Multiple-entry identification key for species of the genus Carex L. in Latvia, 22nd Expedition of the Baltic botanists, Daugavpils University, July 14-17, 2008.

Ŏ Apine I., Tomsone S., Zīra, Kalniņa J. Propagation of rhododendrons in vitro and in vivo. 1st International Symposium on Woody ornamentals of Temperate Zone, Pruhonice, Czech Republic, May 26-30, 2008.

NATIONAL BOTANIC GARDEN OF LATVIA

Period: 2007-2008

Address	Miera Street 1, Salaspils, LV-2159, Latvia
Phone, fax	+371-67945460
e-mail	nbd@nbd.gov.lv
www	http://www.nbd.gov.lv
Director	Andrejs Svilāns
Area	129 ha

STRUCTURE AND STAFF

	2007	2008
Administration	3	5
Financial department	3	3
Information service	9	9
Maintenance service	20	18
Utility service	12	13
Technical service	17	20
Department of Dendroflora	11	11
Department of Open Area Ornamentals	10	10
Department of Hothouse Flowers	6	6
Orangery	2	3
Department of Tissue Cultures	7	10
Department of Useful Plants	3	4
Departnemt of experimental propagation	12	13
TOTAL including:	**126**	**132**
Scientific workers	13	15
Dr.Sc.	12	12

FINANCES (in LVL, *1 LVL = 1.4 EUR*)

Income	**2007**	**2008**
State financing (incl. scientific grants)	931 223	757 999
Own incomes (tickets, plant sell, a.o.)	189 719	179 607
TOTAL	**1 120 942**	**937 606**
Expenses		
Salaries	515 978	528 670
Taxes	120 899	122 703
Communal utilities (heating, electricity, a.o.)	320 079	232 825
Capital expenditures	163 986	31 901
Other expenses	-	21 507
TOTAL	**1 120 942**	**937 606**

LIVING PLANT COLLECTIONS

Total No of taxa: **~15000**

Main taxa	No. of taxa
Indoor plants, including:	**2165**
Greenhouse flowers (gerberas, chrysanthemums, alstroemerias)	450
Orangery plants	1716
Cyclamen cvs.	30
Trees and shrubs, including:	**5380**
Conifers (incl. new forms)	~1000
Rhododendron	250
Crataegus	230
Open area ornamentals, including:	**5580**
Bulbous plants	3290
Rosa cvs.	470
Dahlia cvs.	210
Astilbe cvs.	150
Phlox paniculata cvs.	120
Hosta cvs.	65
Paeonia cvs.	160
Other perennials	277
Asters cvs.	95
Other annuals	~245
Useful plants (berry, technical, medicinal, spice etc.)	**1113**
Rare and endangered plants of Latvia	**131**

Herbarium

50 000 specimens.

THE MAIN ACTIVITIES

Traditional NBG plant markets (2 spring and 2 autumn markets), with participation of nurseries and individual plant growers from all Latvia, and also some growers from Lithuania and Estonia, altogether in **2007** - 458 participants and 10789 visitors, in **2008** – 700 participants and 15139 visitors.

Excursions end exhibitions:

In 2007 – 91 guided excursion; 8 thematic excursions, organized "Rose Day" in NBG, exhibitions "Houseplants in Winter" and "Autumn Roses – Chrysanthemums" in Riga Nature Museum; participation in the exhibitions "Garden and flora" and "Summer Fest for the Garden" (Rīga. Ķīpsala Exhibition

Center), “Plant Parade” (Jelgava), “Rose Days” (Rundale Palace), “Flower Ball” (Latvian Society House).
Number of visitors in **2007** – about 30 000.

In 2008 – 76 guided excursions, 7 thematic excursions; 5 exhibitions organized in NBG: Gerberas and Alstroemerias; Summer Flowers; Medicinal Plants; Asters; Tropical Houseplants; exhibition in Riga Nature Museum: “Autumn Roses – Chrysanthemums”; participation in traditional “Flower Ball” in Latvian Society House (with 75 rose and 12 lily cultivars).
Number of visitors in **2008** - 31 246.

SCIENTIFIC ACTIVITIES

Scientific projects which were carried out in years **2007** and **2008**:

Ŏ The project financed by Latvian Environment Protection Foundation “Development of endangered plant species bank *in vitro* and particular investigation of taxa problematic in cultivation”, (project manager Dr.biol. Dace Kļaviņa).

The scientific projects financed by Latvian Council of Science:
Ŏ “Research of the dendroflora of Latvia” (project manager Dr.biol. Inara Bondare);
Ŏ “Regulation of physiological processes during prolonged cold storage in tissue cultures: creation of the methodological basis for the establishment of taxa bank for the conservation of biological diversity” (project manager Dr.biol. Gunta Jakobsone);
Ŏ “Use of the isolated embryo in vitro method in selection work in the Latvian horticulture” (project manager Dr.biol. Gunta Jakobsone);
Ŏ “Juno irises (Iris subgen. Scorpiris) taxonomy, morphology, nomenclature, cytogenetic, molecular (DNA) investigations, palinology and carpology” (project manager Dr.biol. Arnis Seisums).

Participation in scientific conferences:

2007

Ŏ 3-th international symposium “Acclimatization and Establishment of Micropropagated Plants” (Faro, Portugal) – 2 poster presentations;
Ŏ International conference “EastCentGard II” (European botanic gardens together towards the implementation of plant conservation strategies), Warsaw/Rogow, Poland – 2 poster presentations;
Ŏ University of Latvia 65-th Scientific Conference “Geography. Geology. Environment Science” – 1 oral presentation.

2008

Ŏ 66-th Scientific conference of Latvian University – 2 oral presentations;

- 2-nd World scientific congress “Challenges in Botanical Research and Climate Change” (Delft, The Netherlands) – 3 poster presentations;
- “22-nd expedition of the Baltic Botanists” Daugavpils, Latvia – 1 poster presentation.

Scientific publications:

2007

- Bice M., Knape Dz., Bondare I., Šmite D., 2007. Tukuma rajona dendroloģisko stādījumu koki un krūmi. Latvijas veģetācija 15. Rīga, LU: 7-52.
- Bice M., Knape Dz., Šmite D. 2007. Valkas rajona dendroloģisko stādījumu koki un krūmi. Latvijas veģetācija 15. Rīga, LU: 55-76.
- Bice M., Knape Dz., Šmite D. 2007. Valmieras rajona dendroloģisko stādījumu koki un krūmi. Latvijas veģetācija 15. Rīga, LU: 77-104.
- Bice M., Bondare I., Knape Dz., Šmite D. 2007. Ventspils rajona dendroloģisko stādījumu koki un krūmi. Latvijas veģetācija 15. Rīga, LU: 105-133.
- Bice M., Šmite D., Višņevska L., Roze A. (2007). Index Seminum **LI.**
- Krampis I., Laiviņš M., Bice M., Knape Dz., Evarts-Bunders P., Svilāns A., 2007. Latvijas dendrofloras atlanta projekts. Latvijas Universitātes 65. zinātniskā konference. Ģeogrāfija. Ģeoloģija. Vides zinātne. Referātu tēzes. Rīga, LU Akadēmiskais apgāds. 53-55.
- Jakobsone G., Dapkūniene S., Cepurīte B., Belogrudova I. 2007. The conservation possibilities of endangered orchid species of Latvia and Lithuania. Abstracts (EastCentGard II, July 3-7, 2007), Warsaw/Rogow, Poland, pp. 44-45.
- Jakobsone G., Aleksejeva L. Germination and development of some terrestrial orchids. Poster: Faro, Portugal, 2007, 3. International symposium “Acclimatization and Establishment of Micropropagated Plants”
- Kļaviņa D., Gailīte A., Druva-Lūsīte I. 2007. Asymbiotic cultivation *in vitro* of endangered orchid *Cypripedium calceolus* L. and some aspects of *ex vitro* growth. Stenda referāts: Faro, Portugal, 2007, 3. International symposium “Acclimatization and Establishment of Micropropagated Plants”.
- Šmite D., Gavrilova G., Kļaviņa D. 2007. Latvijas reto augu sugu saglabāšana. Nacionālais botāniskais dārzs, 31 lpp.
- Jakobsone G., Dapkūniene S., Cepurīte B., Belogrudova I. 2007 The conservation possibilities of endangered orchid species of Latvia and Lithuania”. Monographs of Botanical Gardens (European botanic gardens together towards the implementation of plant conservation strategies), Warsaw/Rogow, Poland, Vol. 1: 65-68 (4 lpp.)
- Klavina D., Gailite A., Smite D., Gavrilova G., Nechaeva J., Jakobsone G., Ievinsh G. T2007. Tissue culture as a potential method for preserving of various threatened plant species in Latvia.

2008

- Bice M., Šmite D., Višņevska L., Roze A. (2008). Index Seminum **LII.**
- Bondare I. 2008. New Arboreta in Latvia (Rucava). Referat. The Nordic Arboretum Union Symposium. Finland/ Oulu University. Dendrologinen Aikauslehti, 2009.
- Vishnevska L., Bice M., Galeniece A., Grivina D., Zilins J. 2008. Conifer Collections in the Latvian Botanic Gardens. Book of Abstracts, 2nd World Scientifig Congress Challenges in Botanical Research and Climate Change, 29 June – 4 July 2008, Delft, The Netherlands. 121.
- Jakobsone G. 2008 Morphogenesis of wild orchid *Dactylorhiza fuchsii* in tissue culture. *Acta Univ. Latv*., ser. Biology 745: 17-23 (7 lpp.)
- Klavina D., Ievinsh G. 2008 Growth of tissue culture and changes in oxidative enzyme activity of *Sorbus* and tayberry cultivars during cold storage. *Acta Univ. Latv.,* ser. Biology 745: 179-186 (8 lpp.)
- Jakobsone G., Grants G. 2008 The embryogenesis and development of newly obtained interspecific lily hybrids *in vitro*. *Acta Univ. Latv*., ser. Biology 745: 37-41 (5 lpp.).

VILNIUS UNIVERSITY BOTANICAL GARDEN

Period: 2007-2008

Address	Kairenu 43, LT-10239, Vilnius, Lithuania
Phone, fax	+370 5 2317911
e-mail	hbu@gf.vu.lt
www	www.botanikos-sodas.vu.lt
Director	Dr. Audrius Skridaila
Territory area	198.85 ha

STRUCTURE AND STAFF

	2007	2008
Administration	10	10
Scientists	11	12
Curators of plant collections	13	12
Field workers, personal of maintenance, technicians etc.	48	48
TOTAL including:	82	82
D.Sci	1	1
PhD	8	9
Msc	3	3

FINANCES (in thousands LTL) (3,45 LTL = 1,0 EUR)

Income	**2007**	**2008**
State budget subsidy	1161.0	2711.4
Other state budged assignations	740	550
Projects assignations supported by EU structural foundations	710	5767
Vilnius City Municipality	90	100
Support of other institutions, persons, etc.	197.4	300
Grants	100	60
Other income (trade of plants, tickets etc.)	116.7	170
TOTAL	**3611.5**	**9758.4**
Expenses		
Salaries (incl. taxes)	1390	1808
Infrastructure maintenance	391	490.4
Infrastructure development	1854	7560
TOTAL	**3635**	**9858.4**
Balance of income/expenses	-23.5	- 100 floating debt

LIVING PLANT COLLECTIONS

Total No of taxa: **10000**

Main taxa	No. of taxons
Indoor plants	700
Trees and shrubs	4500
Herbaceous plants	4800

THE MAIN ACTIVITIES

2007

The Botanical Garden of Vilnius University celebrated 225 years of establishment. The Club „Friends of the Vilnius university Botanical Garden" market their 10th birthday too. In spring an opening of sculpture „Fertility" by slovenian sculptor A. G. Gaberi and symbolic gate „Omega" was held under international project „Bridges between universities of Europe". In autumn an open-air exhibition of photografs „Hard Rain" (problems of environmental) by M. Edwards was present to the public.

2007-2008

The Garden has been open to visitors since 2000. In recent years, 20.000 people have been visiting Botanical Garden annually. Botanical Garden was becoming more attractive, new displays were laid out. This was achieved through the project „Adapting the infrastructure of the Vilnius University Botanical Garden to tourism" funded from the EU Structural Funds (the total value of the project was 7.27 million Litas). Soon the Lithuanian Nature Museum, an information centre with a library and a cafe will open.

2008

The construction of Japanese Garden began in autumn. The Botanical Garden became part of Picturesque 80 km route of Vilnius. Drivers can find text and audiogides in 5 languages in website of route.

SCIENTIFIC ACTIVITIES

Main research trends: Plant genotaxonomy and biotechnology of cultivation and reproduction.

Research interests: Introduction and investigation of ornamental and fruit plants; Accumulation, investigation and preservation of plant genetic resources; Investigation of mutagenesis, immunogenetic, polymorphism, genetic instability of plants; Micropropagation *in vitro*.

Research projects carried out in 2007-2008:

- *Projects Supported by University Budget. "*Adaptation of plants and biotechnology of cultivation and reproduction"; "Polymorphism of plants, stability of genome and factors changing it".
- *Projects, Programmes, Issues Supported by the Lithuanian State Science and Studies Foundation.* Programme "Solid-state ligthing technology for plants in phytothrons and greenhouses". Project „Application of molecular markers and epimutations for the assessment of genotoxicity of environmental factors" (2008).
- *Governmental Science Programmes and Research Projects Ordered by the Branch Ministries.* Programme "Scientific research of the plant genetic resource in Lithuania": 1) Investigations on genetic diversity and conservation problems of wild and underutilized small fruit; 2) Accumulation, preservation and investigation of Lithuanian ornamental plants; 3) Polymorphism and economical value of the natural and induced mutants and establishment of their genetic collections.
- *International Science Programs and Projects.* Project "Core collection of Northern European gene pool of *Ribes*". Project "*Triticeae* genomics for the advancement of essential European crops".

2007

R. Juodkaitė maintained a thesis for a degree "Assessment of tulips (*Tulipa* L.) biological diversity and vegetative reproduction potential at the Botanical Gardens of Vilnius University".

2007 – 2008

Since 2003 Botanical Garden has been running the Lithuanian Coordination Centre of research into genetic resources of ornamental plants. Since 2004 Botanical Garden has been administering *Ribes/Rubus* European Central Data Base (www.ribes-rubus.gf.vu.lt).

2008

Bilateral workshop and expedition "Conservation problems of rare plants *in situ* and *ex situ* at Lithuania and Latvia" was organized (2008.07.14-15, Traupis, Veisiejai, Lithuania).

Main publications 2007

- Aučina, M. Rudawska, T. Leski, A. Skridaila, E. Riepšas, M. Iwanski. Growth and mycorrhizal community structure of *Pinus sylvestris* seedlings following the addition of forest litter // Applied and Environmental microbiology. 2007, Vol. 73, No 15. p. 4867-4873.
- Grigaliūnaitė, L. Balčiūniene, Z. Jančys. Pupinių (*Fabaceae* Lindl.) šeimos augalų įvairių veislių antžeminės dalies mikromicetai // Žemės ūkio mokslai. 2006, Nr.4. p. 31-37. Lietuvos MA leidykla. ISSN 1392-0200.

Ŏ Naugžemys, S. Žilinskaitė, J. Denkovskij, J. Patamsytė, J. Literskis, D. Žvingila. RAPD based study of genetic variation and relationships among Lonicera germplasm accessions // Biologija. 2007, Vol. 53. No3, P. 34-39. ISSN 1392-0146.

Ŏ T. Kuisys, D. Naugžemys, A. Skridaila, S. Žilinskaitė, D. Žvingila. Random Amplified Polymorphic DNA Analysis of Genetic Diversity of *Taxus baccata* L. in Provenances Baltic Sea Countries // Baltic Forestry. 2007, Vol. 13, No 2, P. 184-189. ISSN 1392-1355.

Ŏ S. Žilinskaitė, D. Naugžemys, D. Radaitienė, D. Žvingila. Investigation of blue-berried honeysuckle lines and cultivars in Vilnius University Botanical Garden Collection // Sodininkystė ir daržininkystė. 2007, 26 (3), p. 47-56. ISSN 0236-4212.

Ŏ Kurilčik, R. Miklušytė-Čanova, S. Žilinskaitė, S. Dapkūnienė, P. Duchovskis, G. Kurilčik, G. Tamulaitis, A. Žukauskas. *In vitro* cultivation of grape culture under solid-state lighting // Sodininkystė ir daržininkystė. 2007, 26(3), p. 235-245. ISSN 0236-4212.

Ŏ S. Dapkūnienė, J. Varkulevičienė, A. Stankevičienė, O. Motiejūnaitė. Research on morphological and decorative traits of peony originated in Kaunas Botanical garden // Sodininkystė ir daržininkystė. 2007, 26 (3), p. 217-225. ISSN 0236-4212.

Ŏ S. Karhu, K. Antonius, H. Kaldmae, St. Pluta, D. Ryliškis, A. Sasnauskas, K. Rumpunen, E. Schulte, B. Grout. The core collection the Northern European gene pool of *Ribes* createt by RIBESCO project // Sodininkystė ir daržininkystė. 2007, 26 (3), p. 179-186. ISSN 0236-4212.

Ŏ Motiejūnaitė, S. Dapkūnienė. Augalų kolekcijos visuomenės darnaus vystymosi kontekste. Lietuvos saugomų augalų auginimo kultūroje savitumai // Lietuvos biologinė įvairovė (būklė, struktūra, apsauga). 2007. II tomas. 70-84 p. "Lututė". ISSN 1822-2781.

Ŏ Skridaila, T. Kuisys, D. Naugžemys, S. Žilinskaitė, D. Žvingila. Research into *Taxus baccata* L.: genetic diversity in three Baltic Sea countries – part of a regeneration programme of native species in Lithuania // 3 rd Global Botanic Gardens Congress. BGCI. Wuhan (China): Congress Proceedings Online.

Ŏ Ryliškis, G. Jurkevičienė. Hortenzijų (*Hydrangea* L.) rūšys ir veislės: dabartinė padėtis ir sortimento plėtimo galimybės // Dekoratyvinių ir sodo augalų sortimento, technologijų ir aplinkos optimizavimas. Kauno kolegija. 2007.02.22-23. p. 69-72. ISBN 978-9955-27-026-3.

Ŏ Žukauskas, G. Tamulaitis, P. Duchovskis, D. Raklevičienė, S. Dapkūnienė, A. Brazaitytė, G. Samuolienė, A. Urbonavičiūtė, D. Švegždienė, J. Jankauskienė, K. Baranauskas, R. Ulinskaitė, G. Stanienė, A. Kurilčik, J.B. Šikšnianienė, G. Kurilčik, Z. Bliznikas, K. Breivė, S. Žilinskaitė, R. Miklušytė. Kietakūnio apšvietimo technologija augalų fotofiziologinių procesų valdymui //

Sodininkystės ir daržininkystės mokslo tyrimai. Atask. Konf. Medžiaga. Babtai. 2007. Nr. 20. p. 3-9. ISSN 1822-3990.

Ŏ L.Balčiūnienė, V. Vaitkūnienė, A. Drumstienė. Čiustvitelnost k gribnym zabolevanijam genetičeskich linij, mutantov i hibridov jačmenia // Teoretičeskije i prikladnyje aspekty introdukciji rastenij kak perspektivnogo napravlenija razvitija nauki i narodnogo choziaistva. 2007. T. 2. p. 189-190. Minsk. „Edit BB".

Ŏ S. Žilinskaitė, V. Pribušauskaitė, L. Vaišnytė. HBUV. Index seminum Anno 2006. VUBS, 2007.

Ŏ S. Žilinskaitė, V. Pribušauskaitė, L. Vaišnytė. Index Seminum Anno 2007. VUBS, 2007.

Main publications 2008

Ŏ J. Darginavičienė I. Pašakinskienė, G. Maksimov, O. A. Rognli, S. Jurkonienė, V. Šveikauskas, N. Bareikienė. Changes in plasmalemma K^+Mg^{2+}-ATPase dephosphorylating avtivity and H^+ transport in relation to seasonal growth and freezing tolerance of *Festuca pratensis* Huds // Journal of Plant Physiology. 2008, 165, p. 825-832.

Ŏ Kurilčik, R. Miklušytė-Čanova, S. Dapkūnienė, S. Žilinskaitė, G. Kurilčik, G. Tamulaitis, P. Duchovskis, A. Žukauskas. *In vitro* culture of *Chrysanthemum plantlets* using light-emitting diodes // Central European Journal of Biology. 2008, 3(2), p. 161-167.

Ŏ J. Patamsytė, D. Žvingila, J. Labokas, V. Baluckas, L. Balčiūnienė, V. Kleizaitė, V. Rančelis. Study of genetic diversity in wild raspberry (*Rubus idaeus* L.) germplasm collection using morphological characters and RAPD markers // Biologija. 2008, Vol. 54, No 2, p. 66-74. ISSN 1392-0146.

Ŏ R. Juodkaitė, A. Baliūnienė, J. R. Naujalis, M. Navalinskienė, M. Samuitienė. Selection and presentation of tulip (*Tulipa* L.) species and cultivars to the Lithuanian Plant Genetic Resources // Biologija. 2008, Vol. 54, No 2, p. 139-146. ISSN 1392-0146.

Ŏ Kurilčik, S. Dapkūnienė, G. Kurilčik, S. Žilinskaitė, A. Žukauskas, P. Duchovskis. Effect of the photoperiod duration on the growth of *Chrysanthemum* plantlets *in vitro* // Sodininkystė ir daržininkystė. 2008, 27(2), p. 39-46. ISSN 0236-4212.

Ŏ V. Vaitkūnienė, A. Drumstienė, L. Balčiūnienė, R. Šiukšta, R. Mačkinaitė, A. Leistrumaitė, V. Rančelis. Attempts to improve the resistance of plant material by treatment with salicylic and trans-cinnamic acids using barley tw mutants as a model // Modern variety breeding for present and future needs. Proceedings of the 18th EUCARPIA General Congress. 2008.09.9-12, Valencia-Spain. P.485-489.

Ŏ S. Žilinskaitė, E. Meidus, D. Ryliškis, A. Meiduvienė. Селекция, сортоизучение и генетические ресурсы смородины и крыжовника в Ботаническом саду Вильнюсского университета // Современное

состояние культур смородины и крыжовника. Сб. Науч. Тр. ВНИИ садоводства им. И.В. Мичурина. Мичуринск, Россия. 2007, с. 60-65. ISBN 978-5-89609-113-4.
Ŏ G. Jakobsone S. Dapkūnienė, B. Cepurite, I. Belogrudova. Conservation Possibilities of endangered orchid species of Latvia and Lithuania // Monographs of Botanical Gardens. Polish Academy of Science. 2007, Vol. 1, P. 65-68. ISBN 978-83-89959-26-3.
Ŏ R. Juodkaitė, Z. Jančys, A. Baliūnienė. Tulpių (*Tulipa* L.) pagrindinių klasifikacinių grupių veislių vegetatyvinio dauginimosi įvertinimas // Lietuvos biologinė įvairovė, būklė, struktūra, apsauga. III. 2008. p. 20-27. ISSN 1822-2781.
Ŏ J. Patamsytė, D. Žvingila, L. Balčiūnienė, V. Baluckas, J. Labokas, V. Kleizaitė, V. Rančelis. Genotyping of willd rasberry (*Rubus idaeus* L.) accessions with RAPD markers // Proceedings of the International Symposium on new researches in Biotechnology. USAMV, Bucharest Romania. Serie F, Special volume. P. 347-355. ISSN 1224-7774.
Ŏ R. Šiukšta, L. Balčiūnienė, V. Vaitkūnienė, T. Čėsnienė, D. Žvingila, V. Rančelis. Attempts to create the genetic diversity of barley by reversions // Proceedings of the International Symposium on new researches in Biotechnology. USAMV, Bucharest Romania. Serie F, Special volume. P. 13-19. ISSN 1224-7774.
Ŏ Naugžemys, S. Žilinskaitė, D. Žvingila. Интродукция и изучение голубой жимолости (*Lonicera* L.) в Ботаническом саду Вильнюсского университета // Интродукция нетрадиционных и редких растений. Мат. Конф. Т. 1. Плодовые, ягодные, редкие и нетрадиционные садовые культуры. 2008. с. 125-127. Воронеж, Кварта. ISBN 978-5-89609-106-6.
Ŏ S. Dapkūnienė, J. Pakulienė, V. Guseva, O. Motiejūnaitė, J. Varkulevičienė, I. Mažeikienė. Lietuviški bijūnai miestų gėlynams // Miestų želdynų formavimas‘ 2008: gėlės ir gėlynai. Moksl. str. rinkinys. Klaipėda, 2008, p. 24-28. ISSN 1822-9778.
Ŏ Pašakinskienė. Genomų konfliktas ir jo sprendimo būdai augalų tolimuosiuose hibriduose // Mokslas Gamtos mokslų fakultete. Vilniaus universiteto leidykla. 2008, p. 65-76. ISBN 978-9955-33-323-4.
Ŏ D. Ryliškis. Rožių klasifikacija, įvairių jų grupių auginimas Lietuvoje // Dekoratyviųjų ir sodo augalų sortimento, technologijų ir aplinkos optimizavimas, Mastaičiai, 2008, p. 63-68. ISBN 978-9955-27-065-2.
Ŏ Jurkevičienė, A. Skridaila, S. Žilinskaitė, K. Balnytė. Vilniaus universiteto Botanikos sodas. Vadovas. VU leidykla, 2008. 87
Ŏ A checklist of the families and genera of vascular plants in cultivation in botanic gardens. BGCI, Richmond, UK. 2008, 125 p. List of gardens whose records are included in Plant Search ---- Botanical Garden of Vilnius University, Lithuania. ISBN 978-1-905164-22-6.

BOTANICAL GARDEN OF KLAIPEDA UNIVERSITY

Period: 2007-2008

Address	Kretingos str. 92, LT-92327 Klaipeda, Lithuania
Phone	+ 370 46 398832, +370 46 398833, +370 616 40371
Fax	+370 46 398837
e-mail	bs@ku.lt
www	http://www.ku.lt/sodas/
Director	Rūta Žadeikienė
Territory area	9.3 ha

STRUCTURE AND STAFF

	2007	2008
Administration	2	2
Researchs	2	2
Curators of collections	4	4
Other	10	10
TOTAL including:	18	18
PhD	2	2
Msc	6	6

FINANCES (in LTL, *1 EUR = 3.4528 LTL*)

	2007	2008
Income		
State budget subsidy	408 600	459 000
Other state budget assignations	21 000	16 500
Klaipeda City Municipality	21 000	16 500
Other income: trade of plants, tickets etc.	49 606	53 200
Grants	-	4 000
TOTAL	500 206	549 200
Expenses		
Salaries (incl. taxes)	390 000	454 200
Infrastructure development	32 600	39 000
Expeditions and other travels	5 000	4 000
Scientific equipment	-	40 000
TOTAL	427 600	537 200

LIVING PLANT COLLECTIONS

Total No of taxa (2008-12-31): **2904**

Main taxa	No. of taxons
Trees and shrubs (outdoors), including:	1325
Coniferous	365
Deciduous	960
Herbaceous plants (outdoors), including:	1309
Ornamental perennial	920
Ornamental annual	50
Medicinal and space	339
Indigenous on the territory	270

THE MAIN ACTIVITIES

Activities in 2007

Four seminars for the ownes of tourist sites organised and performed in Klaipėda, Šilutė and in Tauragė districts and at the Botanical Garden of Klaipėda University.

Expedition to Russia Federation was organised and implemented. Route of the expedition was Klaipėda-Primorskij-Sosnovka-Morozovka-Jantarnyj-Kaliningrad-Sovietsk-Klaipėda, target objects – tourist attracting places.

Investigation expedition to the tourism objects in Lithuania was implemented on September. Target objects located in Klaipėda, Šilutė and Tauragė district. For the participants of the expeditions were presented the object where the landscape is harmonised and developed representatively. About 20 target objects were investigated.

The main events in the Botanical Garden: "The Earth Day" in March, "The Garden's Day" in May, The International Tourism Day in September, the exhibition of Christmas bouquet in December.

Visitors per year (from April to October) - 4 200; guided tours – 85.

Activities in 2008

The main event was the international seminar, dedicated to 15 anniversary of the Botanical Garden (Botanical Garden of Klaipeda University established in 1993).
Other events: "The Earth Day" in March, The International Tourism Day in September and exhibition "Climate change and botanical gardens" held during this event, the exhibition of Christmas bouquet in December.

Visitors per year (from April to October): 4 758; guided tours – 101.

SCIENTIFIC ACTIVITIES

Scientific projects

Ŏ During 2006–2008, the Botanical Garden of Klaipeda University, in cooperation with the Russian State University of Immanuel Kant in Kaliningrad, has implemented the 'Neighbourhood Programme Project of Lithuania, Poland, and the Russian Federation Kaliningrad Region', ***"Sustainable landscape development: the formation of tourist sites' environment quality by plants".*** The main purpose of the project was the development of cooperation between Lithuania and Kaliningrad, in the field of scientific research activities. The collaboration included the improvement of the landscape quality of public tourist-sites, and their attractiveness to local and foreign tourists. The project objective was: to focus on the deteriorating landscape quality of tourist sites that have cultural, natural, and historical value; as determined by the lack of knowledge by the site's owners and users. The project assessment included the landscape quality of six parks and a botanical garden in Russia, and five estates in Lithuania.

The entire project activity was co-financed by the Development Fund of the European Union.

Ŏ During 2005-2007 Babrungas (Plungė district) Community of families "Tėviškė" in cooperation with the Botanical Garden of Klaipėda University and other environmental and scientific institutions implemented project ***"Cultivation and preservation of rare, endangered and medicinal herbs in Babrungas"***. Families of the community participated in environmental educational programme "Green School", and were trained on cultivation of medicinal herbs, studied recommendations of the researchers. Such knowledge enabled them to restore 2.5 ha of degraded land, to inventory and observe rare and endangered plants in the area, to plant the collection of medicinal and spice herbs, to create Nature Cognitive Path.

The main sponsor of the project – UNDP Global Environment Facility Small Grants Programme.

Scientific publications in 2007

Ŏ Šimkūnas A., Valašinaitė S., Pašakinskienė I. Root growth characteristics of *Festuca*, *Lolium* and *Festulolium* in relation to stress tolerance. *Biologija,* 2007, Nr. 1.

Ŏ Skuodienė R., Nekrošienė R. Impact of perennial legumies and timothy as green manure on productivity of Secale cereale L. and Triticosecale Wittm and on occurrence of cereal diseases. *Agronomy Research. Volume 5. No 1.* Tartu, 2007. P. 59-71.

Ŏ Nekrošienė R. Facility of education activities in the botanical gardens and parks: experience of south Germany. *Natural Science Education. No 1(18).* Šiauliai, 2007. P. 29-33. (In Lithuanian).

Ŏ Nekrošienė R. Cooperation in small business of medicinal plants. *Vadyba. Scientific articles. Nr. 2 (11).* Klaipėda, 2007. P. 164-169. (In Lithuanian).

- Nekrošienė R., Repšienė R. Information facility by the water in the parks and gardens.. *Material of international scientific-parctical conference „formalion of urban green areas'2007: water and plants in landscape".* Klaipėda, 2007. P. 100-103. (In Lithuanian).
- Nekrošienė R. The gardening of the territories of industrial companies of seaport (Klaipeda). *Material of national scientific conference „Optimization of ornamental and garden plants assortment, technologies and environment".* Mastaičiai, 2007. P. 65-68. (In Lithuanian).

Scientific publications in 2008

- R. Nekrošienė. Ornamental and other plants as indicators of environmental quality. Monograph. Kaunas, 2008. 152 p.
- A. Šimkūnas, G. Šiaudinis, K. Mikalauskas, S. Valašinaitė. Refined method of photosynthetic potential calculation. *Botanica Lithuanica*. 2008 No 14(2). P. 95-98.
- S. Valašinaitė, A. Šimkūnas. Size regularities of *Festuca*, *Lolium*, and ×*Festulolium* leaves, as determinate organs. *Botanica Lithuanica.* 2008 No 14(2). P. 99-104.
- R. Skuodienė, R. Nekrošienė. Effects of preceding crops on productivity of winter cereal and their phytopathological state in westhern Lithuania. *Vagos. Scientific articles*.. Nr. 81 (34), Kaunas, 2008. P. 60-67. (In Lithuanian).
- D. Janušauskaitė, R. Nekrošienė, R. Skuodienė. The polish cultivars of x *Triticosecale* Wittm. in Lithuania – effects on biological properties and resistance to diseases *Agronomijas Vēstis / Latvian Journal of Agronomy*, No. 10, Jelgava, 2008. P. 122-127.
- A. Venckutė, R. Nekrošienė. Establishing the use of bioindication method for the assessment of air quality in territories with different urbanization levels. *Scientific research in Westhern Lithuania,* T. VI, p. 166-169, Klaipėda, 2008. (In Lithuanian).
- R. Nekrošienė. Experience of rural community in organizing of children ecological tourism and summer camps. *Vadyba. Scientific articles.* Nr. 2 (13). Klaipėda, 2008. P. 116-119. (In Lithuanian).
- R. Nekrošienė, E. Daubarienė. Ornamental parterres in Lithuanian resorts. *The casebook of scientific articles "Formation of city green places'2008: flowers and flower gardens*". Klaipėda, 2008. P. 101-103. (In Lithuanian).
- A. Venckutė, R. Nekrošienė. Environment air quality – an important factor for the formation of decorative herbaceous plants sortiment in green plantations. *The casebook of scientific articles "Formation of city green places'2008: flowers and flower gardens*". Klaipėda, 2008. P. 169-172. (In Lithuanian).
- R. Nekrošienė, J. Kučinskienė. Outlook for the cultural and ecological tourism in the Botanical Garden of Klaipeda University. *Material of international scientific conference „Recreational & leisure property valuation around the Baltic Sea".* Vilnius, 2008. P. 91-95.
- R. Nekrošienė. Allergic plants in parks. *Material of national scientific conference „Optimization of ornamental and garden plants assortment, technologies and environment*" Mastaičiai, 2008. P. 55-58. (In Lithuanian).
- R. Nekrošienė. Ecological education of children and young people by efforts of rural community. *Proceedings of the fourteenth national scientific-practical conference „Natural science education at a general school-2008".* Šiauliai, 2008. P. 82-86. (In Lithuanian).

ŠAULIAI UNIVERSITY BOTANIC GARDEN

Period: 2007-2008

Address	Paitaičių str. 4, LT-77175 Šiauliai, Lithuania
Phone	+370-41-553 934
Fax	+370-41-393 021
e-mail	dir@bs.su.lt
www	http://www.sodas.su.lt
Director	Doc. Dr. Asta Klimienė
Territory area	2,5 ha

STRUCTURE AND STAFF

	2007	2008
Administration	2	1
Research workers	4	4
Specialists	4	3
workers	6	6
TOTAL including:		
PhD	1	1
Msc	3	3

FINANCES (in *EUR*)

	2007	2008
Income		
Subsidies from university	100 000	139 130
Projects	100	1000
TOTAL	100 100	140 130
Expenses		
Employee's pay and coll. management	100 000	139 130
Education and social activities	100	1000
TOTAL	100 100	140 130

LIVING PLANT COLLECTIONS

Total No of taxa: **3000**

Main taxa	No. of taxons
Trees and shrubs, including:	
Rhododendron	172
Calluna	29

Vaccinium	21
Erica	12
Main taxa	**No. of taxons**
Juniperus	77
Pinus	44
Picea	32
Chamaecyparis	30
Thuja	23
Berberis	18
Acer	16
Lonicera	10
Salix	11
Herbaceous plants, including:	
Iris	150
Hemerocallis	200
Lilium	70
Asteraceae	110
Apiaceae	57
Brassicaceae	51
Lamiaceae	47
Fabaceae	37
Lithuanian red book sort	67
Gentiana	31
Campanula	29
Saxifraga	35
Draba	22
Dianthus	27
Minuartia	14

THE MAIN ACTIVITIES

During 2007/2008 years in Botanic Garden were 3 seminars and conferences; 5 projects for city and region society. There take part students, various education institutions and etc. The biggest projects were: in spring with students (visit over 300 people) and in summer Assumption project (visit over 8000 people). Summer time there was Mark Edwards exhibition "Hard Rain".

SCIENTIFIC ACTIVITIES

Main research areas: Biodiversity *in situ* and *ex situ;* introduction and acclimatization of ornamental plants; phenological observation.

KAUNAS BOTANICAL GARDEN OF VYTAUTAS MAGNUS UNIVERSITY

Period: 2007-2008

Address	Ž. E. Žilibero str. 6, LT-46324 Kaunas, Lithuania
Phone	+370 37 390033
Fax	+370 37 390133
e-mail	bs@bs.vdu.lt
www	http://botanika.vdu.lt/
Director	Vida Mildažienė
Territory area	62,5

STRUCTURE AND STAFF

	2007	2008
Administration	2	2
Department of Plants Pathology	3	4
Department of Dendrology	3	3
Department of Floriculture	20	20
Department of Medicinal Plants	6	6
Department of Pomology	6	6
Technical and transport service	27	27
TOTAL including:	**67**	**68**
PhD	8	8
Msc	1	1

FINANCES (in LT, 1 EUR=3,4528 LT)

	2007	2008
Incomes		
State budget subsidy	1.203.700	1.550.800
Other state budget assignations	375.400	171.800
Other income (tickets, plant sales ect.)	173.600	220.900
TOTAL	**1.752.700**	**1.943.500**
Expenses		
Salaries (incl. taxes)	1.191.800	1.488.200
Other	560.900	455.300
TOTAL	**1.752.700**	**1.943.500**

LIVING PLANT COLLECTIONS

Total No. of taxa: **7139**

Main taxa	No. of taxons
SECTOR OF FLORICULTURE:	**5264**
Ornamental perennial plants	3764
Greenhouse plants	1500
SECTOR OF DENDROLOGY:	**850**
Pinophyta	250
Magnoliophyta	600
SECTOR OF POMOLOGY:	**423**
Actinidia collection	76
Corylus avellana collection	9
Lonicera edulis collection	14
Rubus collection	14
Vaccinium macrocarpon collection	53
Vaccinium oxycoccus collection	120
Vacinium vitis-idaea collection	23
Vaccinium covilleanum collection	64
Vaccinium sp. colecction	33
Viburnum collection	17
SECTOR OF MEDICINAL PLANTS:	**602**
Medicinal plants	419
Spices-melliferous plants	134
Hops	49

SCIENTIFIC ARTICLES

THE *JUGLANS* L. AND *PTEROCARYA* KUNTH FAMILY IN THE TALLINN BOTANIC GARDEN AND ELSEWHERE IN ESTONIA

Jüri Elliku, Anu Kaur. Tallin Botanic Garden

Two plant genera from the walnut family (*Juglandaceae*) are represented in Estonia: the walnut tree *Juglans* and the wingnut tree *Pterocarya*. Of the 21 (44) walnut species, eight species and one variant have been introduced to Estonia, all of which are represented at the Tallinn Botanic Garden.

The distribution of the most common walnut trees, the butternut (*Juglans cinerea*) and Manchurian walnut (*J. mandshurica*) is spread out throughout Estonia. Both species are frost-resistant in Estonia. Although the Manchurian walnut, with its early phenological development, may be damaged by late frost in some years, the tree usually recovers totally. At the known discovery sites, the butternuts are older and have larger dimensions than the Manchurian walnut trees. Apparently, the butternuts were introduced to Estonia earlier than the Manchurian walnuts.

A species that is currently not widespread in Estonia, but very promising, is the Japanese walnut (*J. ailantifolia*). A nice group of 13 trees is growing in the Tallinn Botanic Garden (the seeds were obtained in 1957 and the first blossoming and fruit-bearing occurred in 1980). Since the Japanese walnut buds in early spring, late frost may damage its budding leaves during some years, but generally it is frost-resistant in Estonia. The landscaping value of the Japanese walnut is similar to the butternut and Manchurian walnut. All three species have wide canopies and the foliage comprised of large compound leaves provides unique semi-transparent shade. The variant of the Japanese walnut, the var. *cordiformis,* cannot be considered to have any prospects in Estonia, since it often suffers frost damage.

The common walnut (*J. regia*) can also not be considered to have any prospects in Estonia. Although several specimens that blossom and bear fruit are known to exist in Tallinn and Saaremaa, as well as individual specimen elsewhere in Estonia, this species is generally vulnerable to frost in Estonia. The common walnuts in the Tallinn Botanic Garden have repeatedly suffered frost damage to the snow cover level. In 2001, the plants first started to bear fruit (the seeds were obtained in 1958), but during the harsh winter of 2002-3, they froze again. Currently the trees have recovered as bushes. The largest fruit-bearing specimen in Estonia grows in Kakumäe in Tallinn, where the tree annually generously bears stone fruit. The seeds were obtained from

southwest Ukraine (Vinnytsia). It is possible that this is a seedling from a special plant breed.

Based on unconfirmed oral information, there are about 30 common walnuts discovery sites in Saare County. Based on information from A. Mathiesen, a large, fruit-bearing common walnut existed in the Mõntu Manor Park in Saaremaa during the first half of the 20th century. The tree was also known to West European fruit tree growers who considered it to be a valuable initial form for breeding frost-resistant varieties suitable for the northern regions of Europe. In the 1950s, the tree perished, and the tree was probably chopped down by soldiers of the Soviet Army. Today, an offspring of this tree is known to exist in Kaunispea. It is not impossible that the offspring of this tree exists elsewhere in Saaremaa. Apparently, growing the common walnut is feasible in the coastal areas of Estonia, if a hardy clone and advantageous micro-climatic habitat can be found.

The experience with growing other walnut trees is quite limited. As dendrological rarities, little black walnuts (*J. microcarpa*) from North America grow in both of Estonia's botanic gardens. In the Tallinn Botanic Garden, the plants that have been grown from seeds obtained in 1989 have yet to blossom. Also from North America, the Eastern black walnuts (*J. nigra*) in the Tallinn Botanic Garden are already over 40 years old and have yet to blossom. The Chinese walnut (*J. cathayensis*) from central China and the Chinese (Ussurian) walnut (*J. stenocarpa*) from northern China are closely related to the Manchurian walnut. Both species have blossomed and borne fruit. The *J. cathayensis* (seeds obtained in 1991) started bearing fruit relatively early in 2008, whereas the *J. stenocarpa* (seeds obtained in 1958) first blossomed in 1983, but did not bear fruit until 1987.

THE LIST OF WALNUT TREES INTRODUCED INTO ESTONIA

The list primarily includes specimens that are growing in discovery sites of public locations. The actual number of discovery sites for butternuts and Manchurian walnuts is probably much larger, since both species have been popular landscaping trees for decades and they are often planned for larger residential gardens. There are also much more common walnut trees in Estonia that it might seem from the list of discovery sites. Primary attention has been paid to specimens that bear fruit.

In parentheses is the number of discovery sites, whereas the City of Tallinn is counted as one discovery site. In the case of each taxon, up to five specimens with the largest dimensions are included. An asterisk and parenthesis *) mark the information that originates from 1983-1989 and which has not been checked recently.

Juglans ailantifolia Carriere – (6 discovery sites) University of Tartu Botanic Garden C 128 cm; Harju County Rae Rural Municipality Saare Farm H 10 m C 82+79+64 cm; Tallinn Botanic Garden 13 trees H max 13.5m C max 61+62 cm; West-Viru County Rohuküla H 1.2 m *); Tartu County Järvselja Castle Garden H 2.3 m*). (Cultured in Europe since 1860) I

Juglans ailantifolia var. *cordiformis* (Maxim.) Rehder – (3 discovery sites) Viljandi County Karksi Rural Municipality Pöögle H 7-8 m; Tallinn Botanic Garden H max 1.5 m; Tallinn Vaate Rd. H 10 m C 120 cm; Tallinn Hõbekuuse St. H 9.5 m C 109 cm; Saaremaa Ranna Arboretum. III-IV

Juglans cathayensis Dode – (1 discovery site) TBA 3 trees H max 4.5 m C max 25 cm. I

Juglans cinerea L. – (142 discovery sites) East-Viru County Kuremaa H 16.5 m C 362 cm, C 380 cm, C 321 cm; Valga County Riidaja C 343 cm; Järva County Karinu H 21 m C 321+110 cm; Rapla County Haimre C 304 cm; Valga County Lõve H 21 m C 256+262 cm. (Cultured in Europe since 1656) I

Juglans mandshurica Maxim. - (131 discovery sites) Järva County Rõugu Arboretum 7 trees H 21.5 m C max 244 cm *); Pärnu County Viiratsi H 16 m C 256 cm; C 100+109 cm*); University of Tartu Botanic Garden C 213 cm; Viljandi County Vana-Võidu C 189+134 cm; Jõgeva County Uue-Põltsamaa Ü188. (Cultured in Europe since 1859) II

Juglans microcarpa Berland. – (2 discovery sites) Tallinn Botanic Garden H max 1.5 m, University of Tartu Botanic Garden C 50 cm. (III) IV

Juglans nigra L. - (2 discovery sites) Tallinn Botanic Garden H 11.5 m C 38+53 cm; C 62 cm; C 48+44+46 cm; Saare County Audaku Experimental Station H 8.5 m C 40+44+25 cm. (Cultured in Europe since 1629) III

Juglans regia L. – (10 discovery sites) Tallinn Otsatalu /Oti St. H 9 m C 80+77 cm, Tallinn Kolde Blvd. H 9.5 m C 64 cm; Haabneeme Männi Rd. H 6 m; Harju County Kuusalu Rural Municipality Tapurla shrub-shaped H 6m above; Saaremaa Viidu H 6.5 m C 51+29 cm; Saaremaa Käesla H 6 m C 45+37+40 cm; TBA shrub-shaped H max 2.7 m. IV-V

Juglans stenocarpa Maxim. – (1 discovery site) Tallinn Botanic Garden 7 trees H max 6m C max 40. II

An interesting fact is a butternut and Manchurian walnut hybrid (*J. cinerea* × *J. mandshurica*) identified in Tartu County in Järvselja (Agali). The same hybrid has been observed in the Elistvere Animal Park (plants brought from Järvselja) and it is not impossible that they exist elsewhere in Estonia as well.

Three of the 6-10 species of wingnuts have been introduced to Estonia. These species are growing in the Tallinn Botanic Garden. A relatively large, 13-branched Chinese wingnut is one of the oldest (seeds obtained in 1957). The first blossoming and fruit was recorded in 1989. A group of Caucasian wing

nuts (*Pterocarya fraxinifolia*) is not much younger, although the plants are shrub-shaped and barely 4 meters high, since they suffer frost damage every year. The Japanese wingnut trees (*Pterocarya rhoifolia*) are young, planted only a few years ago.

Wing nut trees are generally vulnerable to frost in Estonia. Frost damage was noticed in the case of the Caucasian and Japanese wingnut trees already in 1940. A. Mathiesen describes the frost damage suffered during the harsh winter of 1939-40 by the shoots of the *Pterocarya fraxinifolia* from the previous year and from the year before and the 3-4-year-old shoots of the *Pterocarya rhoifolia* growing in Raadi in Tartu. A. Mathiesen also mentions that of the walnut trees the *Juglans cinerea* and the *J. mandshurica* did not suffer any damage.

In the case of wing nut trees and other species vulnerable to frost, it is the younger plants that are the most sensitive. Once a plant has succeeded in growing somewhat larger, it becomes hardier in regard to harsh winters. Thus, individual large trees still exist in Estonia – a Caucasian wingnut in Kadriorg Park, a Chinese wingnut in the Tallinn Botanic Garden and a Japanese wingnut in the Uue- Põltsamaa Manor Park. The latter is self-seeding and the seedlings of this tree may also be planted elsewhere in Estonia.

The Caucasian wingnut (*Pterocarya fraxinifolia*) was brought to Europe in 1782. It was not until a hundred years later that the Chinese wingnut (*Pterocarya stenoptera*) (1860) and Japanese wingnut (*Pterocarya rhoifolia*) (1888) arrived in Europe.

THE LIST OF WINGNUT TREES THAT HAVE BEEN INTRODUCED TO ESTONIA WITH ALL KNOWN DISCOVERY SITES

An asterisk and parenthesis *) mark the information that originates from 1983-1989 and which has not been checked recently.

Pterocarya rhoifolia Siebold et Zucc. – (4 discovery sites) University of Tartu Botanic Garden C 162 cm; New Põltsamaa Manor Park H 19 m C 174 cm; Tallinn Botanic Garden H 1 m, Saare County Audaku Experimental Station H 1m.

Pterocarya fraxinifolia (Lam.) Spach – (9 discovery sites) Tallinn Kadriorg Presidential Palace Garden H 12.5 m; C 65+115+74+65+100+81+105+84+ 60+63 cm; Tallinn Botanic Garden H max 4 m shrub-shaped; Valga County Sangaste H 9,7 m C 30+39 cm *); University of Tartu Botanic Garden C 79 cm; C 107 cm, Järvselja H 7,2 m C 22 cm*); Tartu Rõõmu Rd. H 2,4 m*); Harju County Viimsi H 2 m stump shoots. II-III

Pterocarya stenoptera C. DC – (3 discovery sites) Tallinn Botanic Garden H 12.5 m C 75+71+80+55+67+66+65+74+40+32+78+8 8+38 cm; Saaremaa

Audaku Experimental Station H 10 m, C 45+40+25 cm, Võru County Kokemäe Arboretum H 1.9 m*). II-III

The frost-resistance of the walnut and wingnut trees has been assessed by visual observation on a seven-point scale. The methodology used was developed by the Moscow Main Botanic Garden, according to which the plants are divided into following categories based on their frost resistance:

I Plants do not freeze
II Up to 50% of the first-year shoots freeze
III 50-100% of the first-year shoots freeze
IV Older branches also freeze
V Plants freeze to the snow cover level
VI Plants freeze to the ground level
VII Plants freeze totally

Ten taxa (50 herbarium leaves) of the *Juglans* genus can be found in herbarium of woody plants in Tallinn Botanic Garden, whereas in three cases it is spontaneous material. There are four taxa (16 herbarium leaves) from the *Pterocarya* genus represented in this herbarium.

REFERENCE SOURCES

Drevesnije rastenija Glavnogo botanicheskogo sada AN SSSR. Moskva, 1975. pp. 18-19 (in Russian)

Encke, F., Buchhein, G., Seybold, S. Zander. Handwörterbuch der Planzennamen. Stuttgart: Ulmer, 2002. pp. 502, 693.

The Hillier Manual of Trees and Shrubs, 6th Edition. David and Charles, 1993, p 231.

Krüssmann, G. Handbuch der Laubgehölze. Band II. Berlin und Hamburg, 1977, pp. 196-200.

Krüssmann, G. Handbuch der Laubgehölze. Band III. Berlin und Hamburg, 1978, pp. 59-62.

Mabberly, D.I. The Plant Book. Cambridge University Press, 1993. pp 301, 486.

Mathiesen, A. Külmakahjustused puudel ja põõsastel 1939-1940. a talvel. Tartu, 1940, p. 19.

Mathiesen, A. Dendroloogia. Tartu, 1934, p. 265.

THE CURRENT SITUATION AND FUTURE PLANS FOR THE SUBTROPICAL PLANT COLLECTION AT THE TALLINN BOTANIC GARDEN

Anne Jaakson. Tallin Botanic Garden

As of December 2008, the subtropical plant collection at the Tallinn Botanic Garden includes 683 taxa and cultivars from corresponding climatic areas around the world. 317 of these are subtropical orchids.

Greenhouse complex

Broussonetia papyrifera

Doryanthes palmeri

Zygopetalum sp

Many old and substantial plant specimens are invaluable. For example, there is the Canary Island date palm (*Phoenix canariensis*), which was grown from seed in 1930, to mark the birth of Arnold Pukk, who later became the first director of the Tallinn Botanic Garden. This palm has grown to become the largest tree in the greenhouse today. Then there is a 60-year-old Washington palm (*Washingtonia robusta*) and a Norfolk Island pine (*Araucaria heterophylla*) that is more than 70 years old that are also gaining height. A lemon tree (*Citrus limon*), that was planted sixty years ago also proudly displays its fragrant blossoms and delicious fruit.

The collection, which is organized along geographical lines, is divided into three larger groups: plants from Australia and New-Zealand, China and Japan and Mediterranean.

The plants that are characteristic of Australia are basically represented by the forest trees eucalyptus (*Eucalyptus*) and acacia (*Acacia*), and the bottlebrush (*Callistemon*) with its bottlebrush-shaped inflorescences, the thick-trunked bottle tree (*Brachychiton*), the unique kangaroo paw (*Anigozanthos*), a grass with flowers reminiscent of a kangaroo paw, and many other plant species characteristic of the Australian region.

The very rare Australian Wollemi pine (*Wollemia nobilis*) was added to the subtropical plant collection in September 2007. The plant, about the existence of which the botanists had no idea in the past century, came to Nordic countries thanks to the Australian Embassy in Sweden. The gift was handed over to the Botanic Garden by H. E. Mr. Howard Brown, the Ambassador of Australia to the Republic of Estonia.

The Chinese-Japanese collection includes the Japanese camellias (*Camellia japonica*) that are beloved around the world, beautifully flowering hibiscuses (*Hibiscus*), the economically important wild Japanese cedars (*Cryptomeria japonica*), paper mulberries (*Broussonetia papyrifera*) used for paper production, various species of bamboo, and many other plant species characteristic to East Asian flora.

The Mediterranean collection includes historically well-known decorative and functional plants: the common fig tree (*Ficus carica*), the cork oak (*Quercus suber*), the bay laurel (*Laurus nobilis*), the olive (*Olea europaea*), rosemary (*Rosmarinus officinalis*), myrtle (*Myrtus communis*), etc.

The Cymbidium orchid collection, which includes 159 cultivars and 8 species, is of great historical significance. The plant collection was started in 1964, when Oskar Savik, the well-known Australian orchids grower presented the Botanic Garden with a gift of a selection of his best orchids. Later, when he settled in Estonia, he brought historically valuable hybrids that are rare in today's collections. In 1981, plants brought from the Kerteszi nursery in Hungary were added to the Cymbidium collection.

Until June 2008, the subtropical plant collections and expositions were located in three greenhouses. There was also once a fourth building, which was declared unsafe and subsequently closed in 1999. The multifunctional Palm House was reopened in 1999 and is now (March 2009) home to the collections. Two of the three greenhouses were totally rundown and have been in danger of collapse in recent years. The subtropical orchid collection was located in one and the other included both, the subtropical exposition and collection.

Reconstruction work started on the south wing of the greenhouse complex in June 2008. A large glass building will be erected instead of the three existing greenhouses in order to create a single complex with the Palm House at the centre. The project is financed from European Union Structural Funds through Enterprise Estonia, self-financing is provided by the City of Tallinn.

In addition to the foundation and frame, the lighting, watering and heating systems, as well as all the other equipment will be updated. The air humidity level will be regulated using misting equipment, and an automatic drip watering system will be installed in the ground. The rainwater from the roof will be redirected using exterior and interior gutters into a 15 m^3 underground tank. This will provide an excellent opportunity to use rainwater, as well as groundwater for watering the plants.

According to the plan, one third of the greenhouse, which covers almost 1000 m^2 will be dedicated to the propagation of the subtropical collection and the subtropical orchid collection. The remaining two thirds will be divided via symbolic borders into three areas for displaying Chinese, Japanese, Australian,

and Mediterranean flora. Future expositions will be designed in a natural manner using traditional landscape architecture and cultural elements of the given region.

Professional assistance for the design of the Oriental exposition has been requested from the Embassy of the People's Republic of China in Estonia. The establishment of a Chinese Garden within the grounds of the Tallinn Botanic Garden will provide an excellent opportunity to introduce the exceptional uniqueness of the centuries-old Chinese garden traditions and varieties of flora for the first time in Estonia and the Baltic countries along with the opportunity to carry through events to introduce Chinese culture. The plans include the construction of characteristic paths, bridges, terraces, streams, a fishpond and teahouse, which will also make an ideal venue for introducing broader elements of Chinese and Asian culture.

The establishment of the new Australian exposition is based on the master's thesis, "The Principles of Expanding the Flora Exposition of the Australian Region in the Tallinn Botanic Garden", which was written by the author of this article and completed in 2004. The objective of the thesis was to work out the theoretical bases for updating and expanding the flora exposition for this region. During the course of completing the master's thesis and based on available literature, the author compiled an overview of the development of Australia's flora, its primary units of vegetation and experiences with the adaptation and cultivation of plants. Cultivation tests were conducted to examine the success of propagating from seeds, and the potential for a joint display of annual and perennial Australian flora was also tested. The planning of the exposition is based on creation of various primary units of vegetation.

The plan for the Mediterranean exposition includes the characteristic maques and garrigues plants and useful plants known since ancient times. At the same time, a small vineyard will be established to introduce the cultivation of grape vines (*Vitis vinifera*). As a design element, ruins based on Ancient Greek architecture will also be erected.

The subtropical orchid display will be visible through a glass wall, and since orchids bloom at various times of the year, the display will change constantly and the visitors will be able to enjoy the marvellous world of flowering orchids at any time. The orchids with the most eye-catching flowers will be represented, including *Arpophyllum giganteum, Bletilla striata, Bulbophyllum ornatissimum, Coelogyne cristata, C. lactea, Dendrobium chrysotoxum, D. kingianum, D. x delicatum, Stanhopea tigrina, Masdevallia* sp., *Zygopetalum* sp. as well as hybrids of the *Odontoglossum, Oncidium, Brassia, Miltonia* and *Cochlioda.*

FOUNDER OF THE BOTANICAL GARDEN OF THE UNIVERSITY OF TARTU – GOTTFRIED ALBRECHT GERMANN

Heiki Tamm. Botanical Garden of the University of Tartu

In February 12, 1802 after the reopening the University and establishment of the *Naturalienkabinett*, G.A. Germann was asked to the first professor of the general natural history and botany of the University of Tartu.

G.A. Germann was born in Riga (Latvia) in December 19, 1773. He got his education in the Cathedral School of Riga (1782-1792). In 1795, he was graduated from the Faculty of Medicine and Nature Sciences of the University of Jena (Germany), and got his doctor`s degree of medicine and surgery. At the same time, he got additional lectures in botany by G . H. Weber at the University of Kiel (Germany). He was also a founder member of the Society of Nature Investigators of Jena.

In 1796, he got a job in Berlin, where he put in order the Bloch`s collections, and later, in 1798-1800, he had a doctor`s praxise in St. Petersburg (Russia) and in Valmiera (Latvia).

In June 27, 1803, the University Government decided to establish the botanical garden, and Prof. G.A.German was asked to lay out it at the area between of the Tiigi and Vanemuise Streets. He also had to consult the planting of the Toome Hill (Toomemägi) Park. His duty was to establish and keep in order not only botanical collections, but zoological and geological ones too. Later the last ones became as basis of the foundation of the Zoological Museum(founded in 1822) and the Geological Museum (founded in 1820) as well. In 1803-1805, he made some field trips together with his students to study flora of Russian provinces of Estland and Livland (nowadays Estonia and Latvia) , and to complete plant collections and herbarium with the new specimen.

In 1805, he got a professonal gardener Johann Anton Weinmann (1782-1858) to help him to plant the newbotanical garden of area of 4 ha. This plot at Vanemuise Street was rather flat, but had a pond of 0,3 ha. There were many fruit trees growing, left from the previous Pistohlkors Garden.

During a short period, the fence was built around the territory, and the greenhouse with 4 heated rooms was constructed. After the two year hard work, the collections of the botanical garden consisted of 1121 species of plants already.

Unfortunately, there was a shortage of water in the pond to water the plants, and the flat ground did not allow to find different ecological conditions for different plants. In 1806, when Anna Maria Rosenkampff, the wife of a council member, expressed her desire to donate to the University a property of land of 2 ha on the riverside of Emajõgi, it was decided to remove the Garden there.

Prof. G. A. Germann, together with the professonal gardener J. A. Weinmann, planned the collections, and together with the Univeristy architect Johann Wilhelm Krause (1757-1828), designed the buildings, incl. the greenhouses. The construction of greenhouses started in in 1806 and was handed over in September 8, 1808. A taller palm house was located at the central part of the long and narow structure. Round the greenhouse , rectangular flowerbeds were planted in a regular pattern.

In 1807, there were already 2367 species of outdoor plants in the Garden.

In November 28, 1809, unfortunately, prof. G. A. Germann died and was buried at the Raadi Cemetery in Tartu.

There is a discreet memorial stone to G. A. Germann at the botanical garden, which will be renovated in 2009. The burial place at the cemetery was a long time unknown. It is lacking of any sign, but it will be put in order in the year 2009 – 200 years after his death.

Publications by G. A. Germann:

Germann, G.A. 1805. Reise durch Estland, vorzüglich botanischen Inhalts, im Sommer 1803 unternommen von dem Herrn Professor Germann in Dorpat. In: Hoppe, D.H. (Red.) Neue botanishes Taschenbuch für die Anfänger dieser Wissenschaft und der Apothekerkunst auf das Jahr 1805. J.E. Monath und J.F.Russer. Nürnberg und Adorf, S. 57-105.

Germann, G.A. 1805. Beschreibung einer neuen Art der Gattung Valeriana pubescens Herm. Regensb. Bot. Zeit.,23, S. 359-361.

Germann G.A. 1807. Verzeichniss der Pflanzen des botanischen Gartens der kaiserlichen Universität zu Dorpat, im Jahr 1807. M.G. Grenzius, Dorpat. 143 S.

COLLECTION OF MAGNOLIA IN THE BOTANICAL GARDEN OF THE UNIVERSITY OF LATVIA

Ārija Galeniece. Botanical Garden of the University of Latvia

Magnolia is one of the most ancient plants, which is implied by its simple structure. These plants were found already in late Creataceous and Tertiary periods when the family spread throughout the Northern Hemisphere. Today it displays a disjunct geographical distribution. Some two thirds of species are distributed in South Asia, other in South and North America (Azuma et al., 2001). About 245 species of magnolia are recognized (www.bgci.org). Due to their exceptional decorative features, many sorts of magnolia have been developed. Most of them are tropical and subtropical plants. The climate of Northern Europe with cold winters is too hard for magnolias. However, part of magnolias, which originate in mountain regions and which lose leaves in winter could be appropriate for introduction in Latvia.

The introduction of magnolias in Latvia was started more than 50 years ago in the Botanic garden of the University of Latvia (BGUL). The aim of the work was to find out the winter hardy magnolias.

MATERIALS AND METHODS

The magnolia species were grown from seeds obtained from other Botanical Gardens in China, Japan, Germany, Poland, and the Ukraine. Cuttings and plants of cultivars are from Germany and the Ukraine.

The seeds stratified 4-5 months. They were sown in March in the mix of peat and sand substrate (2:1). The incubation was performed in greenhouse at 18±2°C. In a month time the seedlings were picked out in the substrate mentioned above in the pots (0,5 l) and plantlets were acclimatized to the outdoor conditions. In autumn the survived and more vital plantlets were selected for further cultivation. Every winter they were placed in greenhouse without heating for 2 -3 years.

The sorts were propagated vegetative by cuttings and grafting. The rootstock we used were *Magnolia kobus or Magnolia kobus* 'Borealis'.

RESULTS AND DISCUSSION

Currently in our Botanic garden grow 17 taxons of magnolia. Ten of them are species; three are hybrids and four sorts (Table 1). It was found out that all 17 of the tested taxons of the magnolias are indifferent to the climate of Latvia. It could be explained by the fact that the natural habitats of the taxons chosen

Table1. List of magnolia in the Botanic Garden of the University of Latvia.
BG – Botanic Garden

Taxon	Year of introduction	Origin
Magnolia acuminata L.	1958	Kornik Arboretum by Poznan, Poland Ushorod University BG, the Ukraine (seeds)
Magnolia cylindrica E. H. Wilson	1986	Shanghai BG, China (seeds)
Magnolia kobus DC.	1959	Kornik Arboretum by Poznan, Poland Tharandt BG and Arboretum, Germany (seeds)
Magnolia kobus 'Borealis'	1959	Kornik Arboretum by Poznan, Poland (seeds)
Magnolia x kewensis Pearce	2001	Kiev University BG, the Ukraine (seeds)
Magnolia x loebneri Kache	1955	unknown (seeds)
Magnolia x loebneri 'Leonard Messel'	2005	Heinz Pieper nursery, Horn- Bad Meinberg, Germany (cutting)
Maghnolia x loebneri 'Merrill'	2005	Heinz Pieper nursery, Horn-Bad Meinberg, Germany (cutting)
Magnolia obovata Thunb.	2001	Hokkaido Experimental Station for Medicinal Plants, Ohaski, Nayoro, Hokkaido Division, Japan (seeds)
Magnolia salicifolia Maxim.	2000	Kiev University HB, Ukraine (seeds)
Magnolia sieboldii K.Koch	1960	Liverpool BG, Great Britain (seeds)
Magnolia sieboldii K.Koch	2000	BG University of Latvia (seeds)
Magnolia x soulangeana Soul. - Bod.	1936	L. Spaeth nursery, Berlin, Germany (plant)
Magnolia x soulangeana 'Lennei'	1980	Kiev Central BG, the Ukraine (cutting)
Magnolia stellata Maxim.	1980	Kiev Central BG, the Ukraine (cutting)
Magnolia 'Susan'	2005	Heinz Pieper nursery, Horn-Bad Meinberg, Germany (cutting)
Magnolia tripetala L.	1955	unknown (seeds)
Magnolia wilsonii Rehder	2004	Rogow Arboretum, Poland (seeds)

for introduction have North American, Chinese and Japanese origin (Fig. 1). Some species of magnolia such as *M. kobus, M. stellata, M. acuminata M. x loebneri* can grow even in Arboretum of Kalsnava and Arboretum Ledurga. Both arboretums are located in the Eastern part of Latvia where winters are harder than in Riga. Three of magnolias mentioned above grow in Arboretum Mustila of Finland located North of the Baltic Sea (www.mustila.com). It

means that these magnolias are hardy enough to grow in Latvia and further North, but still there is lack of knowledge about the limits of their hardiness.

The oldest trees of the collection age 40 - 50 years. They blossom abundantly. The youngest trees are 4 - 5 years old; they will begin to flower after some years. All species which have been flowering give good seeds, except *M. acuminate* - it only blossoms, but does not give seeds (Table 2). It was observed that *M. kobus* var. *borealis* sometimes self sows. Therefore it can be concluded that they are well adapted to the local climate.

In BGUL grows magnolia of East-Asian and North-American origin. Most of East-Asian magnolias blossom before appearance of leaves. American origin magnolias such as *M. acuminata* and *M. tripetala* flower when leaves have partly developed (Table 2).

In the world there are 131 wild magnolias being in danger of extinction (www.bgci.org). Two species included in IUCN (International Union for Conservation of Nature) Red List of Globally Threatened Magnoliaceae to be found in BGUL collection: *Magnolia cylindrica* as vulnerable and *Magnolia wilsonii* as thretened species (D. Cicuzza et al., 2007).

The public interest in magnolia increases year by year in Latvia, especially for magnolias with Asian origin. They flower before the appearance of leaves at the end of April and beginning of May. Landscape gardeners show increasing interest in magnolias year by year. The introduction of magnolias extends the assortment of flowering trees in Latvia.

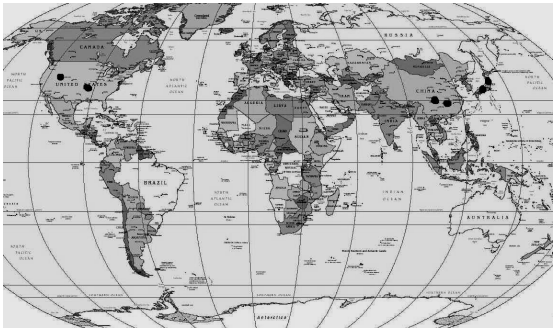


Fig.1. Regions of the natural habitats of the magnolia species introduced in the Botanic Garden of the University of Latvia (marked with bullets).

Table 2. Flowering, seed rising and germination of magnolia in the Botanic Garden of the University of Latvia

Taxon	Flowering (decade and month)	Ripe of seeds	Germination of seeds	
			Outdoor	Indoor
Magnolia acuminata L	II,III May -I June			
Magnolia cylindrica E.H.Wilson	I, II May	x		x
Magnolia kobus DC.	III April -I May	x	x	
Magnolia kobus 'Borealis'	III April –I May	x	x	
Magnolia x kewensis Pearce	No flowering			
Magnolia x loebneri Kache	III April –I May	x		x
Magnolia x loebneri 'Merill'	No flowering			
Magnolia x loebneri 'Leonard Messel'	No flowering			
Magnolia obovata Thunb.	No flowering			
Magnolia salicifolia Maxim.	No flowering			
Magnolia sieboldii K.Koch	III May –III June	x		x
Magnolia x soulangeana Soul.-Bod.	I, II May	x		x
Magnolia x soulangeana 'Lennei'	II, III May	x		x
Magnolia stellata Maxim.	I, II May	x		x
Magnolia 'Susan'	I May –I July			
Magnolia tripetala L.	III May –II June	x		x
Magnolia wilsonii Rehder	No flowering			

REFERENCES

Azuma H., Garcia-Franco J. G., Rico-Gray V. and Thien L. B. (2001) Molecular phylogeny of the Magnoliaceae: the biogeography of tropical and temperate disjunctions. American Journal of Botany 88: 2275-2285.

Cicuzza D., Newton A. Oldfield S. (2007) The Red List of Magnoliaceae. BGCI 5 - 40.

www.bgci.org

www.iucnredlist.org

www.mustila.com

THE COLLECTION OF POISONOUS PLANTS IN THE BOTANICAL GARDEN OF THE UNIVERSITY OF LATVIA

Mārīte Neperte, Lauma Strazdiņa.
Botanical Garden of the University of Latvia

INTRODUCTION

Plant collections in the Botanical Garden of the University of Latvia (BG UL) have been gathered since year 1922, and there are approx. 5800 different taxa now. Among others there is a little collection of poisonous plants.

When swallowed, these plants can cause disturbances to organism damaging the physical-chemical composition of cells and harming metabolic pathways due to biologically active compounds. The major poisonous compounds in plants are alkaloids, glycosides, essential oils, and organic acids (Damberga, 1987). The poisonousness of a plant is very relative, and one could find very different opinions about some plant species and their toxicity if looked in different literature. Also, it is impossible to tell where the bounds between poisonous plants and medicative herbs are, as many of toxic compounds can have a pharmacologic trait and only the dosage defines the effect on human organism (Groms, 1971).

There are almost 100 poisonous plant species found in Latvia (Latvijas Padomju enciklopēdija, 1983), though plants with very high concentration of toxic compounds are not typical in flora, and the risk group most of all are herbivorous animals (Birkmane, Tabaka, 1996).

A separate exposition of poisonous plants has been established within Plant biological and morphological groups already in year 1922. The attention was paid mostly on poisonous plants of different world regions and areas then, nevertheless native flora was also represented.

Collections of BG UL are used in education process very often and are popular among schoolchildren and students of medicine, pharmacology and veterinary medicine. To increase their knowledge about flora of Latvia, the exposition of poisonous plants was improved with species that are native in Latvia. Main aims were to ensure systematic diversity of this collection and to represent all of the major groups of poisonous compounds in plants.

MATERIAL AND METHODS

The largest part of the new collection was gathered during field expeditions along Latvia in year 2005. Both seeds and fresh specimens were collected. Data about occurrence points of very rare poisonous plants came from Latvian Environment, geology and meteorology agency.

RESULTS AND CONCLUSIONS

There are 68 native poisonous plant species in the collection now, representing 57 genera of 22 plant families (Table 1). Most species-rich families are *Ranunculaceae* with 17 species, and *Fabaceae*, *Liliaceae* and *Scrophulariaceae* with 5 species in each. Most species-rich genera are *Polygonatum* and *Ranunculus* with 3 species in each, and *Anemone*, *Euonymus*, *Melilotus*, *Pulsatilla* and *Thalictrum* with 2 species in each.

88% of plant species in collection are local species, while 12% are foreigners – naturalized escaped horticultural plants (*Aquilegia vulgaris* L., *Artemisia absinthium* L., *Heracleum sosnowskyi* Manden, *Trifolium hybridum* L.) and adventive species (*Datura stramonium* L. and *Hyoscyamus niger* L.).

Ranunculaceae with 17 species is the most species-rich family in the collection (Table 1). *Apiaceae* is represented with four highly poisonous plant species. Among others there is *Cicuta virosa* L. which is the most toxic plant in flora of Latvia. Water hemlock contains the poison cicutoxin which is fatal when swallowed, causing paralysis of respiratory centre (Birkmane, Tabaka, 1966).

Table 1. List of poisonous plant species of Latvia in the collection of BG UL

No	Family	Species
1	Apiaceae	Aethusa cynapium L. Cicuta virosa L. Conium maculatum L. Heracleum sosnowskyi Manden
2	Araceae	Calla palustris L.
3	Aristolochiaceae	Aristolochia clematitis L. Asarum europaeum L.
4	Asclepiadaceae	Vincetoxicum hirundinaria Medik. *
5	Asteraceae	Artemisia absinthium L. Senecio jacobaea L. Tanacetum vulgare L.
6	Boraginaceae	Cynoglossum officinale L. Echium vulgare L. Symphytum officinale L.
7	Brassicaceae	Barbarea vulgaris R.Br. Raphanus raphanistrum L. Sinapis arvensis L.
8	Caryophyllaceae	Agrostemma githago L. Saponaria officinalis L. Stellaria graminea L.
9	Celastraceae	Euonymus europaea L. Euonymus verrucosa Scop.
10	Ericaceae	Ledum palustre L.
11	Euphorbiaceae	Euphorbia virgata L. Mercurialis perennis L.

No	Family	Species
12	Fabaceae	Coronilla varia L.
		Lotus corniculatus L.
		Melilotus albus L.
		Melilotus officinalis(L.) Pall.
		Trifolium hybridum L.
13	Lamiaceae	Galeopsis tetrahit L.
14	Liliaceae	Convallaria majalis L.
		Paris quadrifolia L.
		Polygonatum multiflorum(L.) All.
		Polygonatum odoratum (Mill.) Druce
		Polygonatum verticillatum (L.) All. *
15	Papaveraceae	Chelidonium majus L.
		Papaver dubium L.
16	Polygonaceae	Rumex acetosella L.
17	Primulaceae	Anagallis arvensis L.
18	Ranunculaceae	Aconitum lasiostomum Rchb. *
		Actaea spicata L.
		Anemone nemorosa L.
		Anemone ranunculoides L.
		Aquilegia vulgaris L.
		Caltha palustris L.
		Consolida regalis Gray
		Delphinium elatum L. *
		Ficaria verna Huds.
		Pulsatilla patens (L.) Mill. *
		Pulsatilla pratensis (L.) Mill. *
		Ranunculus acris L.
		Ranunculus bulbosus L. *
		Ranunculus sceleratus L.
		Thalictrum aquilegifolium L.
		Thalictrum lucidum L.
		Trollius europaeus L.
19	Srophulariaceae	Digitalis grandiflora Mill.
		Gratiola officinalis L. *
		Linaria vulgaris Mill.
		Scrophularia nodosa L.
		Scrophularia umbrosa Dumort. *
20	Solanaceae	Datura stramonium L.
		Hyoscyamus niger L.
		Solanum dulcamara L.
		Solanum nigrum L.
21	Taxaceae	Taxus baccata L. *
22	Thymelaeaceae	Daphne mezereum L.

* Red-listed plant species in Latvia

There is a number of species in the poisonous plant collection that are included in the Red List of Threatened Species of Latvia (2003) (Table 1):

Category I (endangered species) – *Aconitum lasiostomum* Rchb., *Scrophularia umbrosa* Dumort., *Taxus baccata* L.;
Category II (vulnerable species) – *Delphinium elatum* L., *Gratiola officinalis* L.;
Category III (rare species) – *Digitalis grandiflora* Mill., *Polygonatum verticillatum* (L.) All., *Ranunculus bulbosus* L., *Vincetoxicum hirundinaria* Medik.;
Category IV (data deficient) – *Pulsatilla patens* (L.) Mill., *Pulsatilla pratensis* (L.) Mill.

The largest part of poisonous plant collection – 38 species of 68 – is found in the exposition within Plant biological and morphological groups. Remained species are found in other expositions. So the exposition of Medicative herbs contains *Aristolochia clematitis* L., *Artemisia absinthium* L., *Cynoglossum officinale* L., *Echium vulgare* L., *Linaria vulgaris* Mill., *Melilotus officinalis* (L.) Pall., *Ranunculus bulbosus* L., and *Tanacetum vulgare* L., while poisonous tree species *Daphne mezereum* L., *Euonymus europaea* L., and *Taxus baccata* L. are a part of arboretum. *Calla palustris* L., *Caltha palustris* L., *Cicuta virosa* L., and *Trollius europaeus* L. are plants of wet meadows and watersides and are found in the Decorative-Ecological exposition.

To inform and warn visitors, the labels of poisonous plant species are special marked.

In last years the interest about expositions of BG UL has increased alongside with the number of visitors. To improve and broaden their knowledge about Latvia's poisonous plants, besides the maintenance of present collection it is planned in future to enhance the number of poisonous plants with two other families (*Alismataceae* and *Poaceae*) and three genera (*Lupinus*, *Melampyrum*, and *Vicia*).

ACKNOWLEDGEMENTS

The improvement of the collection of poisonous plants was supported by the Latvian Environmental Protection Fund Administration, Grant No.1-08/220/2005.

REFERENCES

Birkmane K., Tabaka L., 1966. Indīgie ziedaugi Latvijas PSR. Rīga, 54.
Damberga R., 1987. Indīgie augi pļavās un ganībās: Lekcija. Jelgava, 38.
Groms J., 1971. Indīgie ārstniecības augi Latvijas PSR. Rīga, 74.
Latvijas Padomju enciklopēdija, 1983. Indīgie augi, 4. sējums. Rīga, 237.
Latvijas Sarkanā grāmata, 2003. Retās un apdraudētās augu un dzīvnieku sugas, 3. sējums. Rīga, 691.

THE COLLECTION OF SUBTROPICAL AND TROPICAL PLANTS IN THE BOTANICAL GARDEN OF THE UNIVERSITY OF LATVIA IN 2008

Dace Grīviņa. Botanical Garden of the University of Latvia

The Plant houses are situated in the centre of the Botanic garden on the large old manor – house of the Estate. The construction of the plant houses started in 1928. The complex of plant houses includes three buildings for plant collection demonstration and one for plant propagation.

The collections renewed by exchanging seed material with other botanic gardens throughout the world. The plants grow both in length and width, because the roof of palm house has been lift 3 m up in 1953. Plant houses have been rebuilt completely in 1972. In one side of the old palm house a new building in complex with administrative/ management building was made then. The area of new building is 550 m^2, height - 24 m. Tropical, Succulents and Propagation houses were repaired in 1987, but during 2004-2008 all glass in all houses were changed to polycarbonate ones. The total area of plant houses is 1025 m^2.

In accordance to the ecological and systematic principle plants are arranged in three expositions- subtropical, wet tropical and succulent. There are about 1500 taxons (species, varieties and sorts) in our collection. They are gathered and arranged with the purpose of demonstrating the variety of plant families and to show of various genus and species from different floral areas. Recently more attention is paid on arrangement of collections and information the visitors about different plant species. The main tasks are scientific documentation, maintaining and renewing of collections and creating of new ones. Plant collections are made and expositions are arranged to support the course of studies and scientific work in the University of Latvia and to enlighten and train the population, students and pupils in particular.

Each year at February and March the azaleas are demonstrated in exhibition in plant houses. The Botanic garden has presented a part of collections at many exhibitions outside the garden, too. The days of cactuses are organized to popularize the plant diversity.

SUBTROPICAL PLANTS

Subtropical plants occupy 621m^2 area in subtropical house and passageway. There are 357 taxons, among which 64 are grown in soil. The palm collection with 48 plants is biggest in Latvia. The largest is *Phoenix canariensis*. This palm was planted in soil in 1972, when it was 30 years old, and now when it is

65 years old, its height is 20 m, width of crown 10 m and diameter of trunk – 0,76 m. Other species - *Phoenix canariensis var. porphyrococca* and *Phoenix reclinata* have reached 7,8 and 6,4 m width of crown. *Howeia forsteriana* has been presenteD to Botanic garden in 1939 by Latvian composer Jazeps Vitols. Now its ringed trunk has reached the height of 12 m (Table1).

One of the oldest plants in the palm house is *Ficus macrophylla* that is growing here already since 1928. Today it has reached the height of 24 m and width of 9 m immense decuman air roots. Fig tree - *Ficus carica* is delighting us with edible fruits every year. To demonstrate the great diversity of the genus *Ficus* the exposition of 25 different taxons was set up in 2005. In 2008 the collection of *Ficus* was supplemented by18 species and 11 sorts.

There are 11 relic species in subtropical house. One of them is *Metasequoia glyptostroboides*, which was described as fosill find in 1941 and was found growing in the wild in Earst China in 1945. The Botanic garden obtained seeds in 1962, one tree was planted in soil in the Plant houses in 1972, now it has reached 21 m height. Between relic species there is a new acquisition - *Wollemia nobilis*. This species is known from Cretaceous period of Paleozoic era. *Wollemia* was found in 1994 in Australia in West Sidney in Newsouthwales area. On October 9 2007 the Australian Ambassador in Latvia Howard Braun presented wolemia to Botanic garden and it was planted alongside with araucarias. In collection of coniferous trees two araucarias - *Araucaria bidwillii* at 1968 and *Araucaria heterophylla* at 1928 and 1965 are planted, too. Both have got to the roof of 24 m height in time of 10 years. Beside araucarias *Podocarpus* (6 species in collection) are appertained South hemisphere /New World coniferous plants. The exposition contains two more relic species from gymnosperms plants division - *Cycas revoluta* from Jurassic period (200-140 million years ago) and *Ceratozamia mexicana* from Cretaceous period (140-95 million years ago).

5 m high *Magnolia grandiflora* 'Blanchard' was presented by the V. Kargin in 2008, some month later it delighted us with white blossoms.

At any time of the year some plants in the exhibitions are flowering: in winter it is *Jasminum mesnyi, Strelitzia reginae, Clivia*, in spring *Acocanthera veneata*, *Brunfelsia*, but in summer and autumn *Abutilon*, *Hibiscus*, *Lantana*, *Abelia* and others. 10 m high *Strelitzia nicolae* has been growing from 1967 to 2006 and every year it has blue and white blossoms (2008 year 3 blossoms).

One can see also several traditional plants used for food or some other purpose here, for instance, *Phoenix dactylifera*, which is the main source of food for inhabitants of desert, *Ficus carica* - one of the most ancient cultivated plants in Mediterranean region, *Laurus nobilis*- the symbol of military power and nobility in ancient Greece. *Citrus x limon*, *Musa paradisicana* and *Punica granatum* 'Nana', *Psidium* have had fruits each year over the recent years.

Table 1. Structure of significant plants of subtropical and tropical plants in the Botanic Garden of the University of Latvia

Family	Genus	Subtropical plants, taxons	Wet tropical plants, taxons	Succulents, taxons
Acanthaceae		15	5	
Agavaceae			2	13
Aizoaceae				63
Aloaceae				54
	Aloe			22
	Gasteria			16
	Haworthia			16
Amaranthaceae		10		
Araceae		23	49	
Arecacea		48		
Asclepiadaceae		1	3	27
Begoniacea		23		
Bromeliaceae			42	13
	Aechmea		13	
Cactaceae			5	345
	Astrophytum			14
	Ferocactus			18
	Gymnocalycium			13
	Mamillaria			80
	Notocactus			19
	Opuncia			13
	Parodia			21
	Rhipsalis		5	18
Commelinaceae			12	
Crassulaceae				177
	Crassula			30
	Esheveria			20
	Kalanchoe			21
	Sedum			29
Euphorbiaceae			15	25
	Acalypha		6	
	Euphorbia			22
Fabaceae		12		
Moraceae		29		
	Ficus	29		
Myrtaceae		17		
Orchidaceae			38	
Piperaceae			28	
	Peperomia		24	
Polypodiaceae		10	56	

The collection of the greenhouses azaleas were begun established in 1930ies. Since 1957 prof. R. Kondratovics is completes the collection and performs selection work. He has created 16 new sorts. Today the collection comprises 124 sorts, which is the greatest collection of greenhouse azaleas in Latvia and Baltic States. They are grown in experimental green house and transferred to public Plant houses during the flowering period when they form exhibitions.

WET TROPICAL PLANTS

The exposition of wet tropical plants occupies 160m^2 area and contains 349 taxons. Family *Araceae* is represented with 49 taxons (Table 1) and sizable genus *Anthurium*, *Philodendron*, *Spathiphyllum*, *Dieffenbachia* and others. Largest collection of tropical warmth doting ferns in Latvia contains 41 species and 15 sorts, for example, *Asplenium*, *Adianthum*, *Phlebodium*, *Blechnum*, *Pteris* and others. *Lygodium japonicum* is particularly unusual – it is a liana fern that is creeping upwards along its support with hard and strong and incessantly growing stems of leaves reaching the length of 2-3 m. From the wet tropical forest ferns - epiphytes we have *Platycerium bifurcatum*. Relic species is represented by fern-like plants ancestress- *Psilotum nudum*. Very popular cultivated plants are ananas from *Bromeliaceae* family. In collection grows *Ananas comosus* 'Variegatus' which got us fruit in 2008.

Most of epiphytes of *Bromeliaceae* and *Orchidaceae* are common in the rain forest. Two epiphytes trees are placed into the exhibition in 2006 and 2007. Among epiphytic bromelias is *Tillandsia usneoides*, whose very thin and branched - out trunk reaches the height of 1-2 m and hangs from trees like long fringes. Among epiphytic orchids in Plant houses is *Vanille planifolia*, which already has got the length of 2-3 m. Among tropical orchids there are many epiphytes that have richly developed hanging roots, by which they attach themselves to trees or bushes. In Botanic garden these orchids have been attached to chunks of pine- tree bark and are placed above water reservoir. From these plants *Bulbophyllum* flowers in summer with unusual blossoms. The sizable mount of family and genus and taxons are showed in Table 1.

Various tropical water plants grow in basins: *Hetherantera*, *Ceratophyllum*, *Bacopa* and others, as well as several tropical water-lilies. Already from 30-ies years cultivated the largest water lily family plant - Giant water lily - *Victoria amazonica* or *Victoria cruziana*. In wild, in the rivers of Amazon basin Victoria grows as a perennial, yet with us it had to be grown as an annual culture due to the dark autumn and winter periods.

Among the most popular cultivated plants are bananas and coffee. In spring *Mussa acuminata* flowers, which in the second half of summer produces small bananas (2005-2007). *Coffea arabica* seeds are received in 1954 from Delft

Botanic garden. In last years the tree richly flowers and brings out coffea beans. An interesting tree is *Kigelia africana* from 1954 year. *Gloriosa superba* 'Rotschildiana' was abundant in flowers in 2007, *Medinella speciosa* - in 2008. *Allamanda cathartica* and *Allamanda schotti*, *Clerodendrum* x *speciosum*, *Clerodendrum thomsoniae* and *Clerodendrum ugandense* have flowers every year.

SUCCULENT PLANTS

The exposition of succulents contains 714 taxons in 160m^2 area. Sizable family and genus are showed in Table 1. We are proud of our exposition of mamilarias, which every year in April and May delights with multi colored flowers. From 13 *Opuntia* species the oldest is *Opuntia tuberosa*, which has been growing in ground since 1930 and produces yellow flowers in summer.

Cacti of various species and forms have been grafted on *Cereus*. *Pereskia aculeata* is the only cactus with leaves and has been found in exposition since 1964. In total 20 cacti are grown in ground.

Notable age and size has been achieved in growing succulents - like *Beaucarnea recurvata, Furcarea selloa '* Marginata'*, Agave americana* and its 3 sorts, *Euphorbiaceae* family plants- *Synadenium grantii*, *Euphorbia terucalli, Euphorbia milii and Euphorbia ramipressa*.

The collection contains also plants with medical qualities- *Aloe arborescens*, *Aloe vera*, *Agave americana*, *Kalanchoe daigremontiana* and *Kalanchoe pinnata*.

There are many plants in the collection, which contain poisenous juice or some parts of the plant are poisenous. Total amount of poisenous plant is 104, most are found in *Euphorbiaceae* family - 37, *Apocynaceae* - 10, *Araceae* - 10, *Solanaceae* - 8, in others families - some plants.

In greenhouse collections there are 12 species, which trade is regulated by CITES (The Convention on International Trade in Endangered Species of Wild Fauna and Flora).

COLLECTION OF THREATENED PLANTS OF LATVIA IN NATIONAL BOTANIC GARDEN

Dace Kļaviņa, Dagnija Šmite. National Botanic Garden of Latvia
dace.klavina@nbd.gov.lv; dendroflora@nbd.gov.lv

The number of rare and threatened plant species of Latvian flora in National Botanic Garden of Latvia has almost doubled since previous publication in „Baltic Botanic Gardens" (2004). At the moment we have 131 species in *ex situ* collection, field collection contains 123 species of vascular plants, including 6 species, native in NBG area. Most of species (93) produce seeds, some species spreading vegetatively, some don't produce seeds because of different reasons (edafic, climatic etc.), or they are sterile (table 1). During last 7 years with support of the Foundation of Environment Protection of Latvia we have worked out the project "Development of endangered plant species bank *in vitro* and particular investigation of taxa with problems in cultivation", and consequently species collection is significantly enlarged. *Ex situ* collection was supplemented with new species in common expeditions with researchers of various specialities of NBG and Institute of Biology of Latvia University. Now we have 75 species in tissue culture collection. More than a half of them was planted *ex vitro* and added to field collection or used for demonstration to visitors in exposition boxes.

Table 1. Rare and threatened species of Latvia in *ex situ* collections of National Botanic Garden

	Status of protection			Collections	
Species	**RDB**	**Reg.**	**HD**	**Field**	***In vitro***
Aconitum lasiostomum Rchb.	1	*		veg.	
Agrimonia pilosa Ledeb.	-		*	seeds	*
Ajuga pyramidalis L.	2	*		seeds	*
Alliaria petiolata (M.Bieb.) Cavara et Grande	3			seeds	
Allium schoenoprasum L.	3			seeds	
Allium scorodoprasum L.	3			seeds	
Allium ursinum L.	3	*		seeds	
Allium vineale L.	3			seeds	*
Alopecurus arundinaceus Poir.	3			veg.	*
Alyssum gmelinii Jord.	3	*		seeds	*
Androsace filiformis Retz.	2			seeds	
Anemone sylvestris L.	4			seeds	
Angelica palustris (Besser) Hoffm.	1	*	*	seeds	*
Arenaria procera Spreng.	2	*		seeds	*
Armeria maritima (Mill.) Willd.	1	*		seeds	*

Species	Status of protection			Collections	
	RDB	Reg.	HD	Field	*In vitro*
Armeria vulgaris Willd.	1			seeds	*
Astragalus penduliflorus Lam.	1	*		-	*
Astrantia major L.	2	*		seeds	
Betula nana L.	2	*		seeds	
Blysmus rufus (Huds.) Link	2	*		-	*
Bromopsis benekenii (Lange) Holub	2	*		seeds	
Cardamine flexuosa With.	2	*		seeds	*
Carex buxbaumii Wahlenb.	3	*		seeds	*
Carex davalliana Sm.	3	*		flow.	*
Carex ligerica J.Gay	2	*		-	*
Carex montana L.	3			seeds	*
Carex ornithopoda Willd.	3	*		seeds	*
Carex pilosa Scop.	1	*		seeds	
Carex reichenbachii Bonnet	3	*		seeds	
Cenolophium denudatum (Hornem.) Tutin	3			seeds	
Centaurium littorale (Turner) Gilmour	1	*		seeds	*
Cinna latifolia (Trevir.) Griseb.	3	*	*	-	*
Circea lutetiana L.	2	*		seeds	
Cladium mariscus (L.) Pohl	3	*		veg.	
Corydalis cava (L.) Schweigg. et Körte	1	*		seeds	*
Corydalis intermedia (L.) Mérat	2	*		seeds	*
Cotoneaster orientalis A.Kern.	2			seeds	
Crataegus laevigata (Poir.) DC.	2			seeds	
Crataegus lindmanii Hrabêtova	3			seeds	
Crataegus plagiosepala Pojark.	1	*		seeds	
Crepis praemorsa (L.) Tausch	3	*		flow.	
Cypripedium calceolus L.	2	*	*	seeds	*
Dactylorhiza baltica (Klinge) N. I. Orlova	4	*		seeds; wild	*
Dactylorhiza fuchsii (Druce) Soó	4	*		seeds	*
Dactylorhiza incarnata (L.) Soó	4	*		seeds; wild	
Dactylorhiza russowii (Klinge) Holub	4	*		flow.	
Delphinium elatum L.	2	*		seeds	
Dentaria bulbifera L.	3	*		veg.	*
Dianthus arenarius subsp. *arenarius* L.	-	*	*	seeds	*
Dianthus arenarius subsp. *borussicus* Vierh.	-			seeds	*
Dianthus superbus L.	1	*		seeds	
Digitalis grandiflora Mill.	3			seeds	
Dracocephalum ruyschiana L.	2	*		seeds	*
Equisetum telmateia Ehrh.	1	*		veg.	
Erica tetralix L.	1	*		flow.	
Eryngium maritimum L.	1	*		flow.	*

Species	Status of protection			Collections	
	RDB	Reg.	HD	Field	*In vitro*
Euphorbia palustris L.	2	*		veg.	*
Galium schultesii Vest	2	*		flow.	*
Galium tinctorium (L.) Scop.	1	*		seeds	*
Gentiana cruciata L.	3	*		seeds	*
Geranium molle L.	1			-	*
Gladiolus imbricatus L.	3	*		seeds	*
Glaux maritima L.	1	*		flow.	*
Gymnadenia conopsea (L.) R.Br.	4	*		seeds	*
Gypsophila fastigiata L.	3	*		seeds	*
Gypsophila paniculata L.	2			seeds	*
Hedera helix L. var. *baltica* Rehder	1	*		veg.	
Helianthemum nummularium (L.) Mill.	3	*		seeds	*
Hordelymus europaeus (L.) Harz	1	*		veg.	
Hydrocotyle vulgaris L.	2	*		veg.	*
Iris sibirica L.	2	*		seeds	
Jovibarba sobolifera (L.Sims) Opiz	-	*		flow.	
Juncus balticus Willd.	3			seeds	*
Juncus gerardii Loisel.	2	*		seeds	*
Laseripitium latifolium L.	3			seeds	
Lathyrus linifolius (Reichard) Bässler	2	*		flow.	*
Lathyrus maritimus(L.) Bigelow	2	*		flow.	*
Latyrus niger (L.) Bernh.	3	*		seeds	
Ligularia sibirica (L.) Cass.	1	*	*	seeds	*
Linaria loeselii Schweigg.	3	*	*	seeds	*
Liparis loeselii (L.) Rich.	3	*	*	seeds	*
Lithospermum officinale L.	2	*		seeds	*
Lonicera caerulea L. subsp. *pallasii* (Ledeb.) Browicz	3	*		seeds	
Lunaria rediviva L.	4	*		veg.	
Myrica gale L.	3			seeds	
Onobrychis arenaria (Kit.) DC.	3	*		seeds	*
Ophrys insectifera L.	1	*		seeds	
Orchis mascula (L.) L.	3	*		seeds	
Orchis militaris L.	3	*		seeds	
Pentaphylloides fruticosa (L.) O. Schwarz	1	*		seeds	*
Peucedanum oreoselinum (L.) Moench	3			seeds	*
Phleum arenarium L.	1			seeds	
Pinguicula vulgaris L.	2	*		seeds; wild	*
Plantago maritima L.	1	*		-	*
Platanthera bifolia (L.) Rich	4	*		seeds; wild	
Polygonatum verticillatum (L.) All.	3	*		seeds	
Polystichum aculeatum (L.) Roth.	1	*		veg.	

Species	Status of protection			Collections	
	RDB	Reg.	HD	Field	*In vitro*
Polystichum braunii (Spenn.) Fée	1	*		veg.	
Primula farinosa L.	2	*		seeds; wild	
Prunella grandiflora (L.) Scholler	1	*		seeds	*
Puccinelia capilaris (Lilj.) Jansen	1	*		-	*
Pulmonaria angustifolia L.	2	*		seeds	*
Pulsatilla patens (L.) Mill.	4	*	*	seeds	*
Pulsatilla pratensis (L.) Mill.	4	*		seeds	*
Ranunculus bulbosus L.	3	*		seeds	
Ranunculus lanuginosus L.	3	*		veg.	*
Rosa rubiginosa L.	3	*		seeds	
Rosa sherardii Davies	3			seeds	
Sanguisorba officinalis L.	2	*		seeds	*
Saussurea esthonica Baer ex Rupr.	1	*	*	seeds	*
Saxifraga hirculus L.	1	*	*	-	*
Saxifraga tridactylites L.	3			seeds	
Schoenus ferrugineus L.	3	*		flow.	*
Scrophularia umbrosa Dumort.	1	*		seeds	*
Scutellaria hastifolia L.	1	*		flow.	
Serratula tinctoria L.	3	*		seeds	
Silene borysthenica (Gruner) Walters	2	*		seeds	*
Spergularia salina J. et C.Presl	1	*		flow.	*
Swertia perennis L.	0			seeds	
Taxus baccata L.	1	*		seeds	
Thesium ebracteatum Hayne	1	*	*	-	*
Tofieldia calyculata (L.) Wahlenb.	1	*		seeds	*
Tragopogon heterospermus Schweigg.	3			seeds	*
Trifolium alpestre L.	2			flow.	
Trifolium dubium Sibth.	3			seeds; wild	
Trifolium fragiferum L.	2	*		seeds	*
Triglochin maritimum L.	3	*		veg.	*
Tripolium vulgare Ness	1	*		seeds	*
Veronica montana L.	1	*		seeds	*
Vicia lathyroides L.	2	*		seeds	
Vincetoxicum hirundinaria Medik.	3			seeds	
Viola uliginosa Besser	3			veg.	*

RDB – species listed in the Red Data Book of Latvia (2004) (category)
HD - species listed in Annex II of Council Directive 92/43 EEC of 21 May 1992 on the Conservation of Natural Wild Fauna and Flora (Habitats Directive)
Reg. - species included in the Regulations of the Cabinet of Ministers of Latvia Nr. 396.

Field collection includes plants grown outdoor (including plants in wild and exposition boxes).
Veg. – plants in vegetative status – spore plants, newly obtained plants or those that did not flower recently.
Flow. - species that are only flowering (without producing fertile seeds).
Seeds – species producing seeds.

ACKNOWLEDGMENTS

We are thankful to botanists Gaida Ābele, Pēteris Evarts-Bunders, Ģertrūde Gavrilova, Vija Kreile, Agnese Priede, Ilze Rēriha, Normunds Rezevskis so as to our colleagues in NBG Ilze Dubova, Daina Roze, Ruta Rila, Andrejs Svilāns for co-operation in collection supplement, and to Ludmila Vishnevska for encourage and valuable advices.

REFERENCES

D.Kļaviņa, D.Šmite. (2004) Conservation of threatened plant species of Latvia in National Botanic garden. In: Baltic Botanic gardens in 2002-2003. Tartu, 63-69.

LR MK Noteikumi Nr. 396. Noteikumi par īpaši aizsargājamo sugu un ierobežoti izmantojamo īpaši aizsargājamo sugu sarakstu. (Regulations of the Cabinet of Ministers of Latvia Nr. 396.)

Red Book of Latvia. Vol. 3. Vascular plants (2003) Rīga, 691.

DAHLIA CULTIVARS OF LATVIAN BREEDING IN THE COLLECTION OF NATIONAL BOTANIC GARDEN OF LATVIA

Velta Amatniece. National Botanic Garden of Latvia

Garden dahlias (*Dahlia* x *cultorum* Thoesr. et Reis.) are tuberous, perennial, deciduous plants of Asteraceae family. In our climate dahlias do not overwinter in open area conditions, and are grown as annual culture. In autumn the tubers are dug out and placed in storage for winter (Amatniece, 1991).

The first dahlia cultivars were bred in Europe in 19-th century, but in 20-th century they were widely known in all Europe, including Latvia. The number of cultivars grew quickly and they became more and more beautiful and diverse. So, nurseryman from Riga J.Cigra in his catalogue in 1828 was listed 55 varieties for sell, but in 1837 – already more as 500 ones. In Latvia many flower breeders were worked with dahlias. The first officially known was K.Pētersons in 1936, which bred some tens of cultivars (which aren't remained until now), but the best known of Latvian dahlia breeders is Kārlis Ruks (1904-1990). He bred more as 200 new varieties (26 registered as cultivars), and many of them are still grown in our gardens. We have also to mention a great number of cultivars bred by Alfrēds Rudziņš, Jūlijs Lejiņš, Visvaldis Martinsons and many others. Representatives of middle generation like Aivars Baroniņš, Rita Zaļā and others were also actively involved in dahlia breeding (G.Grants (ed.), 1999).

In the National Botanic Garden of Latvia dahlias were grown from its establishing in 1956. The number of cultivars in collection varied greatly from time to time, from 75 up to 335. In the spring of 2009 we have 248 cultivars, including 105 of Latvian origin, which authors are 26 breeders. In the table below there are listed Latvian dahlia cultivars represented in our collection.

Table1. Dahlia cultivars of Latvian breeding in the collection of National Botanic Garden of Latvia

Author*	Name	Variety**	Colour	Diameter of inflorescence (cm)	Plant height (cm)
I. Āboliņa	'Karina'	decorative	very dark red	14	120
	'Megija'	decorative	dark purple	18	140
A. Baroniņš	'Āfrikas Saule' (African sun)	decorative	yellow	18	110
	'Āfrikas Sapnis' (African dream)	decorative	light pink	8	120
	'Alise'	decorative	yellow	9	130
	'Dāmu Deja' (ladies' dance)	decorative	light pink	8	120
	'Debija' (début)	decorative	yellow	9	90

Author*	Name	Variety**	Colour	Diameter of inflorescence (cm)	Plant height (cm)
A. Baroniņš	'Dzirkstīte' (sparkle)	decorative	dark red	8	100
	'Fantazia-Sport'	ball	pink with yellow	12	140
	'Indra K'	semi-cactus	light pink	22	100
	'Kristīne'	semi-cactus	yellow	15	130
	'Lāsīte' (drop)	ball	orange	7	85
	'Lāsma'	pompon	yellow-orange	7	80
	'Lulu'	semi-cactus	violet	16	90
	'Maverick'	decorative	pink	8	80
	'Oskars'	semi-cactus	red	13	95
	'Raibais Joks' (motley joke)	ball	pink and white	10	125
	'Rundāle'	decorative	yellow, pink	12	120
	'Saldā Dzīve' (sweet life)	decorative	orange	8	140
	'Vaira'	cactus	white with violet center	15	90
	'Vineta'	cactus	violet	15	100
	'Zeltīte'	decorative	yellow	12	140
A.Bērzate	'Ķiršu Dārzs' (cherry garden)	pompon	red	8	120
	'Ornaments'	semi-cactus	orange	12	120
	'Pērļu Zvejnieks' (pearl fisher)	ball	white with light pink	11	115
	'Satīns'	decorative	orange	8	100
	'Zelta Cauna' (golden marten)	decorative	yellow	10	120
R.Bumbiere	'Cerību Varavīksne' (rainbow of hopes)	decorative	yellow-oramge	12	100
	'Dzintars' (amber)	decorative	yellow	13	120
	'Gerda'	decorative	orange-red	15	120
	'Smalkā Vizbulīte' (small anemone)	cactus	violet	12	100
M. Celma	'Nauris'	decorative	blue-violet	18	120
Central Young Naturalist Station	'Sprīdītis' (Tom Thumb)	cactus	orange	13	100
	'Maiga'	ball	yellow, white	9	130

Author*	Name	Variety**	Colour	Diameter of inflorescence (cm)	Plant height (cm)
I.and B. Elksniši	'Līgavas Rota' (bride's attire)	decorative	white	11	130
O. Ermalis	'King David'	orchid	deep purple	13	145
	'Miss Viviana'	orchid	deep red	10	110
	'Tobago'	decorative	very deep red	13	100
Juhņēvics	'Evija'	decorative	white with violet tips	12	120
	'Zilais Putns' (blue bird)	decorative	light violet-pink	20	100
L. Karlsone	'Atmiņas' (memories)	decorative	pale violet-pink	13	140
	'Dzērvenīte' (cranberry)	pompon	red	5	130
	'Mirdzošais Prieks' (flaring joy)	cactus	cream	15	110
	'Pasmaidi' (let smile!)	semi-cactus	pink	14	90
G. Klupše	'Alpu Zvaigzne' (Alp star)	decorative	white	8	120
	'Ēvalds Valters'	decorative	light violet	10	110
	'Zane'	collerette	violet, white collar	12	120
R. Kūlainis	'Beverīna'	semi-cactus	light violet	13	140
	'Credo'	decorative	bright red	13	100
Z. Lapiņa	'Annele'	cactus	orange	20	130
	'Kapariņš' (copper)	pompon	brown	6	130
J. Lejiņš	'Ivo'	cactus	light violet-pink	10	100
	'Maskaviete' (Muscowite)	cactus	deep pink	12	120
V.Martinsons	'Bitīte' (been)	cactus	yellow	12	90
	'Ceriņzars' ((lilac's branch)	cactus	violet	12	130
	'Dzīvīte' (life)	decorative	orange, yellow, red	17	120
	'Latvian Red'	decorative	deep red	16	100
	'Mēness Meitiņa' (moon daughter)	cactus	lemon yellow	14	110
	'Raudupiete'	cactus	orange, pink, white	13	120
	'Sole Mio'	ball	yellow	11	135
	'Spuldzīte' (light bulb)	ball	vhite	9	90
	'Valda'	cactus	yellowish-orange	18	110
	'Vidzemniece'	cactus	yellowish-pink	15	110

Author*	Name	Variety**	Colour	Diameter of inflorescence (cm)	Plant height (cm)
V.Martinsons	'Zemgaliete'	cactus	yellowish-pink	14	110
A.Rudziņš	'Gauja'	decorative	violet-pink	10	80
	'Pagātne' (past)	pompon	red	6	110
	'Vētra' (storm)	decorative	yellow	10	150
K. Ruks	'Astotais Marts' (8-th March)	cactus	purple	11	100
	'Direktors (director)	semi-cactus	red-orange	13	70
	'Līgo'	cactus	orange-red	13	70
	'Neons'	cactus	purple	17	120
	'Orbita'	semi-cactus	orange	17	90
	'Ruka Favorīts'	cactus	pink	14	130
	'Šūpļa Dziesma' (lullaby)	cactus	very light pink	17	120
	'Tūrists'	semi-cactus	orange-yellow	13	130
	'Velta Ruks'	cactus	light violet-pink	12	100
	'Zaiga'	cactus	light violet-pink	12	165
	'Zvaigznīte' (starlet)	cactus	red	12	120
O. Sausnīte	'Lita'	ball	orange	10	100
	'Mežezers' (forest lake)	decorative	violet	16	100
E. Siliņa	'Vilma Pika'	decorative	pink with white	15	110
	'Jānītis'	pompon	orange	8	100
J. Škraba	'Pirmais Valsis' (first waltz)	ball	very light pink	9	100
A.Treice	'Ināra'	cactus	orange-pink	13	105
Trifonovi	'Alma'	cactus	orange-pink	11	110
	'Marite'	decorative	red	12	120
	'Mērija'	cactus	raspberry pink	15	150
	'Nianse'	decorative	light pink	11	120
	'Valgunde'	cactus	very light pink	11	105
A. Vegners	'Žanete'	decorative	balta	14	100
A.Vilde	'Lilastes Ceriņi' (lilacs of Lilaste)	cactus	violet	14	130
R.Zaļā	'Agni'	cactus	orange	14	150
	'Aiga'	cactus	light pink	14	80
	'Apelsīni Sniegā' (oranges on the snow)	decorative	orange with white	15	140
	'Aprīļa Pilieni' (April drops)	ball	white, pink	10	100
	'Esmeralda'	decorative	violet	6	40
	'Džūlija'	decorative	deep violet	11	80

Author*	Name	Variety**	Colour	Diameter of inflorescence (cm)	Plant height (cm)
R.Zaļā	'Lelle' (doll)	decorative	yellow-pink	13	100
	'Meža Ziedi' (forest flowers)	decorative	orange, yellow	15	50
	'Rudacīte' (brown-eyed)	decorative	orange with dark centre	8	150
	'Rudā' (red-haired)	semi-cactus	dark yellow	17	100
	'Salna' (frost)	orchid	greenish-white, with violet shade	15	100
	'Viola'	ball	violet	12	100
E.Zvejniece	'Didam'	cactus	yellow	14	130
	'Džūlija'	cactus	dark red	18	120

*- The cultivars are listed in order of breeder's family name

**- Varieties (cultivar groups) are given according to classification of the National Dahlia Collection, UK. (2009)

REFERENCES

Amatniece V. (1991) Dālijas. In: Latvijas ieteicamo krāšņumaugu sortiments. (Recommended ornamental plants assortment of Latvia) Rīga, 178-183.

Grants G. (ed,) (1999). Dālijas. In: Latvijas selekcionāru ziedi. (Flowers of Latvian breeders). Riga, 142-154.

https://www.national-dahlia-collection.co.uk/ (2009) - The homepage of National Dahlia Collection (Winchester Growers, UK).

THE FLORICULTURE DEPARTMENT OF THE BOTANICAL GARDEN OF VILNIUS UNIVERSITY

Gitana Štukėnienė. Botanical Garden of Vilnius University

ABSTRACT

The Floriculture Department of the Botanical Garden of Vilnius University was established in 1992. Its main goals are introduction of herbaceous decorative plants (field flowers), acclimatization, and accumulation of plants for collections, their care, conservation and creation of plant exposition. Herbaceous ornamental plants collections rich in genera, species, cultivars and hybrids (3000 plant names of 80 families and 320 genera) have been accumulated and preserved.

The unique genefund of Lithuanian herbaceous ornamental plants (flower cultivars created by Lithuanian plant breeders) accumulated and preserved in the Botanical gardens of Vilnius University involve ten genus. These are perennials, rootstocks, corms, flowers wintering and not wintering outside flowers. At the Vilnius University Botanical garden there are: *Crocus* – 18, *Dahlia* – 198, *Gladiolus* – 110, *Hemerocallis* – 3, *Iris* – 180, *Lilium* – 50, *Narcissus* – 7, *Paeonia* – 91, *Primula* – 30 and *Tulipa* – 30 Lithuanian cultivars. Nurseries are established for the conservation of the genefund of these flowers. In general, Lithuanian cultivars are original, adapted to the local climate conditions, and it is urgent to conserve, investigate and foster it as a part of the lands culture. The morphological-ornamental and bioecological properties of these genera plants: *Gladiolus* L.*,* and *Paeonia* L. were researched and estimated.

Keywords: cultivars, morphological, decorative, bioecological properties and genefund.

INTRODUCTION

Botanical gardens have a long history. The first botanical gardens in Europe were founded in the mid 16th century in Italy. The Botanical Garden of Vilnius University was founded in 1781 by a French professor, J. E. Gilibert. More than 220 years ago together with the Natural History Department, and throughout all these years the two were closely associated. Despite its honourable age, the Garden remains young, because it changed its place four times. The main activities of the Botanical Garden: conservation of plants genetic resources, scientific researches, training and education. The scientists of the Garden are working in several scientific programs. Today the Botanical Garden is striving to be not only a research centre, but also to become an

attractive recreation site for the population. The Garden is open to visitors from May until November. Plant introduction is one of the basic tasks and ways of the botanical gardens to enrich their collections. One of the plant introduction centers in Lithuania is the Botanical Garden of Vilnius University.

Vilnius University Botanical Garden takes part in the national program "Genetic Resources" which was started in 1998 by the Lithuanian Ministry of Education and Science. The program encompasses the conservation and research of the genetic resources of agricultural and horticultural crops, medicinal and ornamental plants, forest trees and domesticated animals. Since 2002 Ornamental Plants' Genefund Resources Research and Protection Coordination Centre is working in the Botanical Garden of Vilnius University now. The authors of Lithuanian flower cultivars (both amateurs and professionals) have created priceless national wealth i.e. flower cultivars and hybrids. Therefore, collection, preservation, investigation and evaluation of Lithuanian flower genefund are a new trend of scientific researches not only in the botanical gardens but also in the whole country.

MATERIALS AND METHODS

Flower cultivars created by Lithuanian plant breeders are introduced and grown in special collection nurseries in the Floriculture Department of the Botanical Garden of Vilnius University. The investigations, descriptions and evaluations of morphological, phonological, propagation and ornamental properties of gladioli, *Iris* L. and peony *Paeony* L. cultivars were carried out in the period of 1998 – 2008 according to the requirements of the International Union for the Protection of New Varieties of Plants (UPOV), North American Gladiolus Council (NAGC) and methodologies used in neighbouring countries (Anonymous, 1988; Ogorodnikiene, Juronis, 1988; Radionenko, 2002; Ruks, 1978; Varkuleviciene, 1999).

In the gladioli description the data is presented in the following order: 1) the index of the cultivar, 2) the name of the cultivar, 3) the author of the cultivar, 4) the year of the cultivar creation, 5) the beginning of flowering (cipher or index). The size of a blossom is characterized by the first number of the index: 200 – blossom size is 6,5 – 9 cm.; 300 – blossom size from 9 to 11,5 cm.; 400 – blossom size 11,5 – 14 cm.; 500 – blossom size more than 14 cm. The colour of the blossoms and leafs are determined according to the international R.H.S. (The Royal Horticulture Society) colour chart.

Peonies were planted in open area in rows to the eastwest direction. The distance between rows was 1 m., between individual plants – 0,8 m.

RESULTS

The Floriculture Department of Botanical Garden Vilnius University was established in 1992. Herbaceous decorative plants (field flower) collections rich in genera, species, cultivars and hybrids (3000 plant names of 80 families and 320 genera) have been accumulated and preserved. Accumulation, preservation and investigation of the genefund of herbaceous ornamental plants is a new research trend not only in the Botanical Gardens but in the whole republic as well. For the first time in Lithuania a unique collection of flowers (cultivars, hybrids and numerous seedlings) created by local breeders (both amateurs and professionals) has been accumulated. The unique genefund of Lithuanian herbaceous ornamental plants accumulated and preserved in the Botanical gardens of Vilnius University involve ten genus (*Table* 1). These are perennials, rootstocks, corms, flowers wintering and not wintering outside flowers. At the Vilnius University Botanical garden there are: *Crocus* – 18, *Dahlia* – 198, *Gladiolus* – 110, *Hemerocallis* – 3, *Iris* – 180, *Lilium* – 50, *Narcissus* – 17, *Paeonia* – 91, *Primula* – 30 and *Tulipa* – 30 cultivars (local cultivars). Nurseries are established for the conservation of the gene fund of these flowers. In general, Lithuanian cultivars are original, adapted to the local climate conditions, and it is urgent to conserve, investigate and foster it as a part of the lands culture (Dainauskaite and Indrisiunaite, 1997).

Table 1. Collections of herbaceous ornamental plants in Botanical Garden (number of taxa)

Genera	Number of taxa		
	Foreign origin	Lithuanian origin	Total
Crocus L.	3	18	21
Dahlia cultorum Thorsrud et Reisaeter	317	198	515
Gladiolus L.	20	110	130
Hemerocallis L.	104	3	107
Iris L.	200	180	380
Lilium L.	60	50	110
Narcissus L.	10	7	17
Paeonia L.	182	91	273
Primula L.	40	30	70
Tulipa L.	130	30	160

***Gladiolus* L.** The genus *Gladiolus* L. includes over 255 species (fam. *Iridaceae, Monocotyledons*), many of them are native to South Europe, Africa and Asia In the natural environment of Lithuania there are 2 species of gladioli, other species are grown as ornamental ones. Almost in every district *G. imbricatus* L. grows, while *G. palustris* Gaudin can be rarely found and therefore it is

preserved. The diversity of gladioli species and cultivars is great, that is the reason why it is not easy to classify them. To make it more convenient, while describing gladioli they are grouped according to the length of flowering, the height of the plant, the form of the spike, the size of the blossom, the colour of the blossom, the ways of their application in the green plantation, resistance to diseases and pests.

At present in the collection of Vilnius University Botanical Garden there are 130 gladioli cultivars of both foreign and Lithuanian origin. In Lithuania gladioli are the most popular plants with flower breeders who successfully carry out selection with these flowers. Gladioli are valued for the cultivars of blossom colours, simple growing and fast propagation. The diversity of the gladioli blossoms' colours is huge – from a snow-white to dark brown colour. Anyway, up till now there has not been a research analysing the gladioli cultivars created in Lithuania. It is important to do this, as all Lithuanian cultivars are not thoroughly investigated yet. The most distinguishing and attractive (unbelievable form, perfect display of blooms in the spike, colour harmony) Lithuanian gladioli cultivars, researched in the Botanical Garden of Vilnius University, are the following ones: 'Feja' (author P. Ciplijauskas), 'Laimute' (P. Ciplijauskas), 'Onutė-3' (P. Balčikonis), 'Saules takas' (P. Balčikonis), 'Spalvingas sapnas' (J.A. Liutkevičius).

Lithuanian gladioli cultivars (created in 1984–1999 by Lithuanian plant breeders) differ among themselves by their morphological, ornamental and biological properties (Table 1). The most distinguishing and attractive (unbelievable form, perfect display of blooms in the spike, colour harmony) Lithuanian gladioli cultivars, studied in the Botanical Garden of Vilnius University, are the following ones: 'Fiji' (author A. Lukosevicius), 'Nu, Gromov, Pogodi!' (P. Ciplijauskas), 'Laimute' (P. Ciplijauskas), 'Merkurijus' (A. Lukosevicius), 'Onute-3' (P. Balcikonis), 'Paparcio ziedas' (P. Ciplijauskas), 'Saules takas' (P. Balcikonis), 'Snieguole' (P. Ciplijauskas), 'Solveiga' (A. Lukosevičius), 'Spalvingas sapnas' (J.A. Liutkevicius).

***Paeonia* L.** Peony belongs to *Paeoniaceae* family, *Paeonia* genus. There are known 52 species in genus, mainly spread in Eastern and Central Asia, less spread in Southern Europe and North America. The taxonomy of the genus *Paeonia* is controversial. The International register includes about 5000 peony cultivars. 69 per cent of all peony cultivars are originated from Chinese peony (*Paeonia lactiflora* Pall.). 30 per cent comprise group of peony hybrids (*Paeonia hybrida* hort.) created by cross-pollination Chinese, common and other peony species. Only 1 per cent of peony cultivars are originated from common peony (*Paeonia officinalis* L.) The majority of tetraploid peonies are allopolyploids derived from crosses between phylogeneticaly distinct diploid lineages (Sang, 2005; Sang et al., 2004).

In the collection of Botanical garden are growing 273 species, cultivars and hybrids of peony. After some years of research we recommended nineteen cultivars created by O. Skeiviene and twenty-five cultivars created by E. and J. Tarvidai to register as National Plant Genetic Resources. The Lithuanian breeder professional O. Skeiviene created a great number of cultivars and hybrids of peony. The detected pathogens *Botrytis paeonia* Oud., *Fusarium oxysporum* Schltdl., *Septoria paeonia* Vest. did not couse significant damage to plants. These peonies distinguish themselves by various morphological, decorative and biological properties. Lithuanian cultivars are original, adapted to the local climate condition and it is urgent task to conserve, investigate and foster them as a part of our culture. Forty-four cultivars of peony created by Lithuanian plant breeders (O. Skeiviene, E. and J. Tarvidai) are confirmed by Orders of Minister of Environmental as National Plant Genetic Resources. These cultivars will be preserved in future.

REFERENCES

Anonymous, 1988: Guidelines for the conduct of the test for distinctness, homogeneity and stability. UPOV. (International Union for the Protection of New Varieties of Plant. TG/108/3 Gladiolus L.), Geneva. 1 – 33.

Dainauskaite D. and Indrisiunaite G., 1997. Genetic resources of ornamental field herb plants and their preservation problems in Lithuania. p. 54-57. In: Baltic Botanic Gardens in 1996 Estonia, Latvia, Lithuania. Riga. Latvia.

Ogorodnikienė V., Juronis V., 1988: Jurginai. Vilnius.

Skridaila, G. Indrisiunaite, 2003. The Botanical Garden of Vilnius University at work. Scripta Botanica Belgica. Volume 27. 48.

Sang T. 2005. Phylogeny and biogeography of Paeonia (Paeoniaceae). The Ohio Ssstate University. 40-115.

Sang T. Pan J., Zhang D., Ferguson D., Wang Ch., Pan K., Hong D. 2004. Origins of polyploids: an example from peonies (Paeonia) and a model for angiosperms. Biological Journal of the Linean Society. T 82. 561-571.

A COLLECTION OF COLORFUL HARDWOOD IN VILNIUS UNIVERSITY BOTANICAL GARDEN

Viktorija Guseva, Gintarėlė Jurkevičienė.
Vilnius University Botanical Garden

SUMMARY

The article describes a collection of colorful hardwoods gathered in Dendrology department of VU Botanic Garden since 1977. Variety of plants and their decorative features are overview, the possibility to adapt them in greens are proposed and their acclimatization to climatic conditions in South-East Lithuanian experience are discussed.

Keywords: Colorful deciduous trees, collections, green, composition, plant derivatives.

INTRODUCTION

Green must to look good all year round, to attract attention to their beauty and colors. Combinations should not be too much load of contrast, diversity of forms and they must adapt to the existing environment and buildings.

A collection of colorful hardwood in Botanical Garden of Vilnius University started to accumulate in 1977 and consistently to be filled by new taxon. Today in collection we have plants belong to17 families, 29 genera, 100 taxon (Table 1). Plants stems, leaves, flowers and fruits are decorative. The decoration throughout vegetation is finding and some of the stems and leaves in winter do not change color. This is sufficiently resistant plants in South-East Lithuanian climatic conditions.

Colorful plants are very important in urban environments in green territories

MATERIALS AND METHODS

100 taxon of plants, their steams, leaves, flowers and fruits decoration were investigated in Dendrology department of VU Botanical Garden (Table 1). Flower color intensity, duration of flowering and seasonality was studied (Baronienė, 2002).

Defined by the taxonomy (The Hillier Manual of Trees and shrubs, 1997, 2002, Griffiths 1997, Navasaitis, 2005).

The results of acclimation of South-East Lithuanian climatic conditions were discussed (Baronienė V., 1999, No. Januškevičius, Baronienė V., V. Lingienė October, 2006).

RESULTS AND DISCUSSION

Trees with wide crown and colorful leaves suited to identify and highlight the space (*Acer pseudoplatanus* 'Purpureum', *Fagus sylvatica* 'Purpurea Latifolia', *Fagus sylvatica* 'Purpurea Tricolor', *Fraxinus excelsior* 'Variegata', *Fraxinus pensylvanica* 'Variegata', *Malus* 'August Vaga') (Table 1). These plants are planted individually or in small groups. They are the best highlights of the beauty of other plants and buildings.

Beech (*Fagus sylvatica* 'Dawyck Gold') is a dense, columnar tree, planted in hedgerows is a beautiful and expressive. The yellow color does not overshadow other plants.

Table 1. Colorful hardwood taxon and assessment the decorative according the different parts of the plant (stems, leaves, flowers and fruits) in VU Botanical Garden

N	Inventory number	Family	Taxon	Individual plant parts - coloration and decorative features
1.		Aceraceae	*Acer campestre* 'Postelense'	leaves
2.	770141a	Aceraceae	*Acer pseudoplatanus* 'Purpureum'	leaves
3.	780034	Anacardiaceae	*Cotinus coggygria* 'Purpureus'	stems, leaves, inflorescences
4.	911202	Apocynaceae	*Vinca minor* 'Argenteovariegata'	leaves
5.		Apocynaceae	*Vinca minor* 'Atropurpurea'	flowers
6.	992029	Betulaceae	*Betula pendula* 'Biribin'	stems, leaves, catkins
7.	050941	Betulaceae	*Betula pendula* 'Golden Bark'	leaves
8.	851029	Berberidaceae	*Berberis lycium* 'Atropurpurea'	leaves
9.	931466	Berberidaceae	*Berberis x media* 'Red Jewel'	leaves
10.	801002	Berberidaceae	*Berberis thunbergii* 'Atropurpurea'	leaves
11.	911250	Berberidaceae	*Berberis thunbergii* 'Atropurpurea Nana'	leaves
12.	941020	Berberidaceae	*Berberis thunbergii* 'Aurea'	leaves
13.	060659	Berberidaceae	*Berberis thunbergii* 'Aurea Nana'	leaves

N	Inventory number	Family	Taxon	Individual plant parts - coloration and decorative features
14.	951305	Berberidaceae	*Berberis thunbergii* 'Bagatelle'	leaves
15.	971243	Berberidaceae	*Berberis thunbergii* 'Bonanaza Gold'	leaves
16.	050927	Berberidaceae	*Berberis thunbergii* 'Dart's Red Lady'	leaves
17.	930573	Berberidaceae	*Berberis thunbergii* 'Golden Ring'	leaves
18.	981624	Berberidaceae	*Berberis thunbergii* 'Helmond Pillar'	leaves
19.	050926	Berberidaceae	*Berberis thunbergii* 'Harlequin'	leaves
20.	060657	Berberidaceae	*Berberis thunbergii* 'Maria'	leaves
21.	961383 971216	Berberidaceae	*Berberis thunbergii* 'Red Chief'	leaves
22.	961383	Berberidaceae	*Berberis thunbergii* 'Red King'	leaves
23.	830057	Berberidaceae	*Berberis thunbergii* 'Rose Glow'	leaves
24.	790140	Berberidaceae	*Berberis vulgaris* 'Atropurpurea'	leaves
25.	970506	Berberidaceae	*Berberis vulgaris* 'Violaceae'	leaves
26.	971024	Buxaceae	*Buxus sempervirens* 'Latifolia Maculata'	leaves
27.	861046	Caprifoliaceae	*Sambucus nigra* 'Aurea'	leaves
28.	060660	Caprifoliaceae	*Sambucus nigra* 'Black Beauty'	stems, leaves, flowers
29.	982173	Caprifoliaceae	*Symphoricarpos orbiculatus* 'Follis Variegatis'	leaves
30.	050640	Caprifoliaceae	*Symphoricarpos x doorenbosii* 'Amethyst'	fruits
31.	990516	Caprifoliaceae	*Viburnum lantana* 'Aurea'	leaves
32.	041423	Caprifoliaceae	*Viburnum lantana* 'Marmorata'	young leaves
33.	010417	Caprifoliaceae	*Viburnum lantana* 'Variegata'	leaves
34.	950169	Caprifoliaceae	*Viburnum opulus* 'Xanthocarpum'	fruits
35.	891068 941051	Caprifoliaceae	*Weigela florida* 'Follis Purpureus'	leaves, flowers
36.	971290	Caprifoliaceae	*Weigela* 'Red Prince'	flowers

N	Inventory number	Family	Taxon	Individual plant parts - coloration and decorative features
37.	941057	Caprifoliaceae	*Weigela florida* 'Variegata'	leaves, flowers
38.	982157	Caprifoliaceae	*Weigela florida* 'Victoria'	flowers
39.	940249	Celastraceae	*Euonymus europaeus* 'Albus'	fruits
40.	951205	Celastraceae	*Euonymus fortunei* 'Blondy'	leaves
41.	931331	Celastraceae	*Euonymus fortunei* 'Emelad Gaiety'	leaves
42.	911094	Celastraceae	*Euonymus fortunei* 'Emerald'n Gold'	leaves
43.	931299	Celastraceae	*Euonymus fortunei* 'Sunspot'	leaves
44.	951204	Celastraceae	*Euonymus fortunei* 'Variegatus'	leaves
45.	031361	Cornaceae	*Cornus alba* 'Aurea'	stems, leaves
46.	781029	Cornaceae	*Cornus alba* 'Elegantissima'	stems, leaves
47.	012010	Cornaceae	*Cornus alba* 'Gouchaultii'	stems, leaves
48.	911092	Cornaceae	*Cornus alba* 'Sibirica Variegata'	stems, leaves
49.	911129	Cornaceae	*Cornus alba* 'Spaethii'	stems, leaves
50.	781027	Cornaceae	*Cornus sericea* 'Flaviramea'	stems
51.	050715/2	Cornaceae	*Cornus sericea* 'Kesleyi'	stems
52.	050954/2	Cornaceae	*Cornus sericea* 'White Gold'	stems, leaves
53.	982124	Corylaceae	*Corylus avellana* 'Aurea'	leaves
54.	811000	Corylaceae	*Corylus avellana* 'Fuscorubra'	young shoots, stems, fruits
55.	931170	Grossulariaceae	*Ribes nigrum* 'Marmoratum'	leaves
56.	992006	Fagaceae	*Fagus sylvatica* 'Dawyck Gold'	leaves
57.	801001	Fagaceae	*Fagus sylvatica* 'Purpurea Latifolia'	leaves
58.	961496	Fagaceae	*Fagus sylvatica* 'Purpurea Tricolor'	leaves
59.	970118	Hydrangeaceae	*Hydrangea quercifolia* W. Bartram	leaves
60.	891073	Hydrangeaceae	*Philadelphus caucasicus* 'Aureus'	leaves
61.	980150	Lamiaceae	*Lavandula angustifolia* 'Nana Alba'	leaves, flowers

N	Inventory number	Family	Taxon	Individual plant parts - coloration and decorative features
62.	970566	Lamiaceae	*Lavandula angustifolia* 'Rosea'	leaves, flowers
63.	930401	Lamiaceae	*Salvia officinalis* 'Rosea'	flowers
64.	931185	Oleaceae	*Ligustrum vulgare* 'Aureovariegata'	leaves
65.	020133	Oleaceae	*Ligustrum vulgare* 'Chlorocarpum'	fruits
66.		Oleaceae	*Ligustrum vulgare* 'Glaucum'	leaves
67.	982121	Oleaceae	*Fraxinus excelsior* 'Variegata'	leaves
68.	982119	Oleaceae	*Fraxinus pensylvanica* 'Variegata'	leaves
69.	982143	Rosaceae	*Crataegus laevigata* 'Paul's Scarlet'	flowers
70.	060773/2	Rosaceae	*Crataegus laevigata* 'Rubra Plena'	flowers
71.	971153	Rosaceae	*Dasiphora fruticosa* 'Abbodtswood'	flowers
72.	982166	Rosaceae	*Dasiphora fruticosa* 'Hopley's Orange'	flowers
73.	041462/2	Rosaceae	*Dasiphora fruticosa* 'Lovely Pink'	flowers
74.	031156	Rosaceae	*Dasiphora fruticosa* 'Marian Red Robin'	flowers
75.	031341	Rosaceae	*Dasiphora fruticosa* 'Pretty Polly'	flowers
76.	971283	Rosaceae	*Dasiphora fruticosa* 'Princess'	flowers
77.	031340	Rosaceae	*Dasiphora fruticosa* 'New Dawn'	flowers
78.	982167	Rosaceae	*Dasiphora fruticosa* 'Pink Queen'	flowers
79.	961481	Rosaceae	*Dasiphora fruticosa* 'Primrose Beauty'	flowers
80.	992045	Rosaceae	*Dasiphora fruticosa* 'Red Ace'	flowers
81.	031339	Rosaceae	*Dasiphora fruticosa* 'Tangerine'	flowers
82.	982168	Rosaceae	*Dasiphora fruticosa* 'Tilford Cream'	flowers
83.	911301	Rosaceae	*Malus* 'August Vaga'	leaves, flowers

N	Inventory number	Family	Taxon	Individual plant parts - coloration and decorative features
84.	982174	Rosaceae	*Prunus padus* 'Colorata'	young stems, leaves, flowers
85.		Rosaceae	*Prunus virginiana* 'Schubert'	young stems, leaves
86.	050718	Rosaceae	*Prunus x cistena* (E.N.Hansen) Koehne	stems, leaves , flowers
87.	982171	Rosaceae	*Physocarpus opulifolius* 'Diabolo'	young stems, leaves, flowers
88.	992030	Rosaceae	*Physocarpus opulifolius* 'Darts Gold'	leaves
89.	781023	Rosaceae	*Physocarpus opulifolius* 'Luteus'	leaves
90.	982161	Rosaceae	*Spiraea x bumalda* 'Dart's Red'	flowers
91.	911064	Rosaceae	*Spiraea x bumalda* 'Goldflame'	leaves
92.	891042	Rosaceae	*Spiraea x cinerea* 'Greifsheim'	leaves
93.	010237	Rosaceae	*Spiraea japonica* 'Albiflora'	flowers
94.	050716/2	Rosaceae	*Spiraea japonica* 'Golden Carpet'	leaves
95.	971286	Rosaceae	*Spiraea japonica* 'Goldmound'	leaves
96.	891069	Rosaceae	*Spiraea japonica* 'Macrophylla'	leaves
97.	050714	Rosaceae	*Spiraea japonica* 'Magic Carpet'	leaves
98.	970344	Rosaceae	*Spiraea japonica* 'Shirobana'	flowers
99.	951172	Salicaceae	*Salix repens* 'Argentea'	leaves
100.	951185	Salicaceae	*Salix integra* 'Hakuronishiki'	leaves

Maple (*Acer campestre* 'Postelense') - a small sapling in yellow, small leaves vegetation at the beginning. This elegant tree is best for small plants compositions where yellow color is needed highlight.

Chokecherry (*Padus virginiana* 'Schubert') change color. The young leaves are green, but soon becomes pink and later - violet color. Good plant when to be a red accent.

Bird Cherry (*Prunus padus* 'Colorata') flowers are pale purple. Early in the spring they take a unique charm.

European Weeping Birch (*Betula pendula* 'Biribin') with red and (*Betula pendula* 'Golden Bark') with yellow leaves are wonderful near buildings and for spaces of the larger gamut of colors to complement.

Shrub diversity is very high. This is a variegated and colorful leaves, stems, flowers and fruits of different shapes and heights (from 0.5 m to 3-4 m), the beautiful blooming plants.

Common Hazel (*Corylus avellana* 'Fuscorubra') with red and yellow (*Corylus avellana* 'Aurea') leaves can be grown in large spaces.

Common ninebark (*Physocarpus opulifolius* ' Diabolo') with red leaves and pink umbrella inflorescences, (*Physocarpus opulifolius* 'Dart's Gold', *Physocarpus opulifolius* `Luteus') with yellow leaves and white umbrella inflorescences are suitable for open areas, as accents near the buildings and for the planting hedgerows.

Wild privet (*Ligustrum vulgare* 'Aureovariegata') with variegated and (*Ligustrum vulgare* 'Glaucum') with the gray leaves are best in compositions with green bushes.

Wayfaring Tree (*Viburnum lantana* 'Aurea', *Viburnum lantana* 'Marmorata' *Viburnum lantana* 'Variegata') cultivars are with characteristic leaves color. These shrubs are large. They are the best accent in a sunny place.

Black Elder cultivar (*Sambucus nigra* 'Black Beauty') with dark red leaves and pink flowers, another cultivar (*Sambucus nigra* 'Aurea') with yellow leaves are ideal for planting as a solitary or in groups. In this case plants provide the charm for the existing environment and buildings.

No one can resist the small hawthorn trees (*Crataegus laevigata* 'Paul's Scarlet' and *Crataegus laevigata* 'Plena rubra') flowering. Trees produce many pink flowers and are very decorative in every place.

Barberries various forms, leaf color well in groups, planted in combination with green plants. *Berberis lycium* 'Atropurpurea', *Berberis vulgaris* 'Atropurpurea' and *Berberis vulgaris* 'Violaceae' are the high bushes. Well it seems in combination with small trees, shrubs and herbaceous plants. *Berberis x media* 'Red Jewel Park', *Berberis thunbergii* 'Atropurpurea', *Berberis thunbergii* 'Aurea', *Berberis thunbergii* 'Golden Ring' *Berberis thunbergii* 'Red Chief', and *Berberis thunbergii* 'Rose Glow' are a medium height, suitable for low compositions in combination with coniferous (*Juniperus*, *Taxus*, *Thuja*, *Microbiota*), with low trees, shrubs and herbaceous plants. Barberries with columnar crown such as *Berberis thunbergii* 'Helmond Pillar' and *Berberis thun*bergii 'Red King' have red leaves. These cultivars are best suited for plant compositions, where the required a color contrast. *Berberis thunbergii* 'Bagatelle', *Berberis thunbergii* 'Aurea Nana', *Berberis thunbergii* 'Bonanza Gold' are very good for rockery and trailing compositions.

Dogwoods are decorative all year round. Leaves white or yellow margin (*Cornus alba* 'Elegantissima', *Cornus alba* 'Sibirica Variegata', *Cornus alba* 'Spaethii', *Cornus sericea*' White Gold '), yellow (*Cornus alba* 'Aurea', *Cornus alba* 'Gouchaultii'). Red stalks throughout the year (*Cornus alba* 'Elegantissima', *Cornus alba* 'Sibirica Variegata', *Cornus alba* 'Spaethii', *Cornus sericea* 'Kesleyi', *Cornus alba* 'Gouchaultii') or yellow (*Cornus sericea* 'Flaviramea', *Cornus sericea* 'White Gold'). We recommend use cultivars as accents only.

Green should look attractive and have an aesthetic view of the entire growth season. More flowering plants need to include into the compositions. Well suited for this purpose shrubby cinquefoil (*Dasiphora fruticosa*) varieties (Table 1). There is very wide range of colors from pale pink, orange to dark red. There are long-blooming shrubs from June to strong frost when flowers are frozen. Shrubby cinquefoil suitable to all combinations.

Meadowsweet is one of lovely genus in gardening. Different species and much their cultivars are used. This is a great shrub for empty space to fill, yellow and red to compensate. This is a beautiful and long-blooming shrub. *Spiraea x cinerea* `Greifsheim' is shrub with gray leaves, and pendulous branches, wonderful white inflorescences. It is good plant for groups to establish and for hedgerows.

Meadowsweet (*Spiraea x bumalda* 'Goldflame', *Spiraea japonica* 'Goldmound') with yellow leaves, *Spiraea japonica* 'Macrophylla' – with red leaves, all of them are suitable for various combinations with green plants (deciduous trees, herbaceous and coniferous). *Spiraea japonica* 'Golden Carpet', *Spiraea japonica* 'Magic Carpet' both are very good to grow with the trailing and rockery plants. Meadowsweets flowers are beautiful and colorful: *Spiraea japonica* 'Albiflora' - white flowers, *Spiraea x bumalda* 'Dart's Red' - redflowers. This is the perfect combination of warm and cold colors to compensate. *Spiraea japonica* 'Shirobana' - this is a miracle plant. Variegated shrub, and pink and white, with color change.

Almost all the plants sufficiently resistant to the adverse, low temperatures, except common box (*Buxus*), hydrangea (*Hydrangea*), snowberry (*Symhoricarpos*), willows, (*Salix*), lavender (*Lavandula*), smoke bush (*Cotinus*), sage (*Salvia*), land (*Vinca*) genera (Table 1). These plants need the warmer microclimate and protection from the wind sites.

Weigela - are shrubs with beautiful flowers. Some cultivars of *Weigela* 'Red Prince' have expressive red flowers, *Weigela florida* 'Victoria' – pink flowers. Another cultivars - red leaves and pink flowers: *Weigela florida* 'Follis Purpureus' and variegated foliage and light pink flowers: *Weigela florida* 'Variegata'. All of them are sensitive to adverse conditions. It`s necessary to protect the shrubs from the winds, select the warmer places.

Smoke tree (*Cotinus coggygria* 'Purpureus') with red leaves and subtle inflorescences, box (*Buxus sempervirens* 'Maculata Latifolia') with yellow-variegated leaves, and willow (*Salix integra* 'Hakuronishiki ') with variegated leaves all they are sufficiently sensitive to climatic conditions of Lithuania, they lose decorative features. It is necessary protect plant from the winds, care in winter: spread of specific material.

Low willow with grayish leaves (*Salix repens* 'Argentea') is an ideal for rock-garden and the green slopes.

Euonymus fortunei 'Emelad Gaiety', *Euonymus fortunei* 'Variegatus' with white variegated leaves and *Euonymus fortunei* 'Blondy', *Euonymus fortunei* 'Emerald'n Gold', *Euonymus fortunei*' Sunspot' with yellow-variegated leaves are perfect for trailing compositions and for rock-gardens.

Common periwinkle cultivars - *Vinca minor* 'Argenteovariegata' with yellow variegated leaves and *Vinca minor* 'Atropurpurea' with purple flowers are suitable for green compositions as a plant to the contrast.

Common lavender (*Lavandula angustifolia* 'Rosea') with pink flowers, and *Lavandula angustifolia* 'Nana Alba' with white flowers, common sage (*Salvia officinalis* 'Rosea') with pink flowers are ideal for trailing compositions and rocker-gardens, too. Planting in sunny places, sheltered from the wind site they are beautiful. Lithuanian climate become warmer in recent years, the majority of the described plants are hardy. We had some winters the temperature was below -25 ° C in South-Eastern Lithuania. But in many cases the lowest temperature not extreme here below -25° C in winter.

After the end of flowering previously described species become important. And some others such as *Euonymus europaeus* 'Albus', *Symphoricarpos x doorenbosii* 'Amethyst', *Viburnum opulus* 'Xanthocarpum', *Ligustrum vulgare* 'Chlorocarpum' fruits and leaves are decorative (*Hydrangea quercifolia*). These plants valuable are valuable.

You can choose many of plant species. Some of them were described above (see Appendix 1, Table 2). Colorful plants can not dominate in plant compositions. To maintain harmony and balance is necessary.

CONCLUSIONS

1. Botanical gardens – this is the live plant databases, with a large number of genus, species and varieties.

2. Botanical gardens – it is institutions where beauty, love, respect for the environment is fostered.

3. Green must serve to people. Green – it is an integral part of our nature. We need to have an impact on environmental management.

REFERENCES

Baronienė V., 1999: Lapuočių medžių ir krūmų dekoratyvinių formų introdukcija ir aklimatizacija Lietuvoje (daktaro disertacija). – Vilnius

Baronienė V., 2002: Lapuočių dekoratyviosios formos Lietuvos želdynuose. – Dendrologia Lithuaniae, 6:3-11

Griffiths M., 1997: Index of Garden Plants. – London (Great Britain)

Hiller Nurseries 1998: The Hillier Manual of Trees and Shrubs. David & Charles, 928 p.p.

Hiller Nurseries 2002: The Hillier Manual of Trees and Shrubs. David & Charles, 512 p.p.

Januškečius L., V. Baronienė V., Lingienė D., 2006: Sumedėjusių augalų introdukcija ir aklimatizacija bei jų rezultatai ir perspektyvos Lietuvoje (monografija). - Kaunas, Lulutė, 389 p.

Navasaitis M., 2005. Dendrologija. – Vilnius, Margi raštai , 830 p.

COLLECTION OF MEDICINAL AND SPICE PLANTS IN THE BOTANICAL GARDEN OF KLAIPEDA UNIVERSITY

Rita Nekrošienė. Botanical Garden of Klaipeda University
rita_nekrosiene@mail.ru

INTRODUCTION

Botanic gardens have a long-standing connection to medicinal plants in particular, since the sole purpose of all early botanic gardens was to grow and study medicinal plants. They are inherently well-placed to respond to the very specific local conservation needs of medicinal plants and the people who rely on them for health and livelihood in a particular region. Using botanical and cultivation knowledge there are a number of key ways in which botanic gardens can contribute towards medicinal plants conservation and sustainable use (Hawkins, 2008). Medicinal plants are clearly an important global resource in terms of healthcare but they are also an important economic resource, traded extensively on scales ranging from local to international. Internationally, the trade in medicinal plants is estimated to be worth $60 billion per year (World bank, 2004) increasing at a rate of 7% a year (Koul & Wahab, 2004). Very little of the raw material to supply this demand is from cultivated sources. Of the 3,000 or so species known to be in international trade (Schippmann et al, 2006) there are approximately 900 for which commercial cultivation is underway or in development (Mulliken & Inskipp, 2006). About 20,000 tons of medicinal plants worth $18–20 million are traded every year in Nepal alone, and about 90% are harvested in uncontrolled fashion by landless, resource-poor mountain farmers for whom the harvest and trade in medicinal plants constitutes their only form of cash income. The situation is similar in Bangladesh, Bhutan, India, and other countries in South Asia (Mappa, 2007).

In the Botanical Garden of Klaipeda University medicinal and spice plants investigated from 2001 (Nekrošienė, 2001).

The aim of this research – evaluation of structure of the collection of medicinal and spice plants in the Botanical Garden of Klaipeda University.

MATERIAL AND METHODS

Study of literature, analysing of documentation.

RESULTS AND DISCUSSION

In 2008, there were 59 families, 182 genera, 310 species, and 25 forms of medicinal and spice plants. In total, there are three-hundred and thirty nine (339) taxons. The most-abundant number is of *Lamiaceae* family, with 58 species, 22 genus. It represents almost twenty percent (20%) of all of the plants in the collection. The family of *Asteraceae* is abundant, as well: 52 species, 25 genus; *Fabaceae* and *Alliaceae*, by 17 species; *Apiaceae*, 15 species, 12 genus; *Rosaceae*, 14 species, 10 genus (Table 1). Some other families contained only 2-3 species.

Table 1. Taxonomic structure of medicinal and spice plants. Klaipeda, 2008.

No	Family	Number of genera	Number of species and forms
1.	Lamiaceae	22	58
2.	Asteraceae	25	52
3.	Fabaceae	10	17
4.	Alliaceae	1	17
5.	Apiaceae	12	15
6.	Ranunculaceae	6	14
7.	Rosaceae	10	14
8.	Scrophulariaceae	5	12
9.	Plantaginaceae	1	9
10.	Papaveraceae	4	8
11.	Polygonaceae	4	8
12.	Solanaceae	5	8
13.	Brassicaceae	7	7
	Other families	71	100
	Total 59	**183**	**339**

There are the usual and the commonly-known plants e.g., turnip-rooted parsley (*Petroselinum sativum* Hoff.), wild chamomile (*Matricaria recutita* L.), common yarrow (*Achillea millefolium* L.), common caraway (*Carum carvi* L.), common and mugwort wormwood (*Artemisia absinthium* L., *A. vulgaris* L.), common pot-marigold (*Calendula officinalis* L.), black salsify (*Scorzonera hispanica* L.), different species of thyme (*Thymus* L.), and common valerian (*Valeriana officinalis* L.). In addition, the collection includes many rare and protected, or useful plants, of no self–generation in Lithuania. The mild climate of the Baltic seashore allows growing of some plants that like heat. The plants from the areas that extend outside of the borders of Lithuania, being difficult to reach their natural habitats, are very-important for students and the city community in the sense of human awareness.

About thirty percent (30%) of plants cultivated in the collection are descendants from southern and middle Europe. Euro-Asian plants are the second most-abundant in the collection. Representatives from the American

continent in the collection under investigation consist of only 7 percent of all plants.

Caucasus, and the stinking and pink hellebore (*Helleborus orientalis* Lam., *H. foetidus* L., *H. purpurascens* Waldst. and Kit.) begin to bloom before the end of winter. These are self-generated plants of southern and middle Europe. Their root-stock, containing glycoside and saponin, are used to produce preparations for treatment of heart diseases. These plants introduced themselves fairly-well into our conditions; only some leaves were somewhat frozen this year.

Spring adonis (*Adonis vernalis* L.), of self-generation in western Europe and middle Asia, starts to bloom early spring. Due to its pretty bright-yellow blossoms, this plant may be cultivated in parterres. Early spring blossoms of *Bergenia crassifolia* (L.) Fritsch, from the Altaj Mountains, bring joy. However, this is not a mere medicinal and ornamental plant, but also one containing tanid properties. The blossoms of scopolia (*Scopolia carniolica* Jacq.) are very-interesting and resemble small bells. It is a medicinal plant of self-generation in middle and southern Europe, named to honour the Italian botanist, Scopoli.

In this collection there also grow Gasplant Dittany (*Dictamnus alba* L.) from southern Europe. Many useful properties distinguish common liquorice (*Glycyrrhiza glabra* L.), a plant from the steppes and desserts. It is valuable as a food and medicinal attribute (especially loved by children for its sweet taste), as well as a technical and melliferous plant. It is cultivated on plantations. Research work should be implemented to investigate the possibilities of growing large quantities of this plant in western Lithuania.

The common castor oil plant (*Ricinus communis* L.) also enriches the collection. This is a medicinal, oily, fibrous, insecticidal plant from eastern Africa. However, it is a poisonous plant. As many as five (5) varieties of sage (*Salvia* L.), distinguished by aromatic, ornamental and medicinal characteristics, grow here. As a compliment, common sage (*S. officinalis* L.) distinguishes itself by soil-stabilising properties. Several varieties of garlic grow in the collection; unfortunately, not all of them are identified.

Bears' Garlic (*Allium ursinum* L.) is worthy to be mentioned individually. By early spring, its leaves are used for food. This plant grows perfectly well in woods, but it grows sickly and languishes in the Botanical Garden collection. It was planted in the collection three (3) years ago, having been brought from the forest in the Klaipeda region. More-detailed investigation of the plant should be performed to determine regularities of its ecological spreading, as well as its possibilities of increased production.

Rattlesnake weed and purple coneflower (*Echinacea angustifolia* (L.) DC., *E. purpurea* (L.) Moench.) should be mentioned individually, as being plants that have travelled to Lithuania from as far as North America. Common moonseed

(*Menispermum canadense* L.) from North America, and daurische moonseed *(M. dauricum* DC.) from East Asia, as well as *Dioscorea caucasica* Lipsky and *D. floribunda* M., all grow very richly. The most-abundant (with 10 species) in the collection is the genus of mint (*Mentha* L.): *M. arvensis* L., *M. dumetorum* Schult., *M. longifolia* (L.) Huds., *M. piperita* L., and others. Finally, there is the genus of *Thymus*, with eight (8) species.

It is necessary to undertake more-detailed research of the promising medicinal and spice plants, which are well-adapted to growing in the conditions of the Lithuanian marine climate; and to prepare recommendations for industrial growing of these plants based on such research.

CONCLUSIONS

1. At present in the collection of medicinal and spice plants there grow representatives of 59 families, 183 genera and 310 species. In total – 339 taxa. The most abundant families are*: Lamiaceae, Asteraceae, Fabaceae*.
2. About 60% of all plants in the collection are alien plants. Prevailed plants from South and Middle Europe.
3. It is necessary to replenish the collection in the nearest future with valuable flora of self-generation, paying exceptional attention to plants growing on the Curonian Spit and Baltic sea cost.

REFERENCES

Hawkins, B. 2008. *Plants for Life: Medicinal Plant Conservation and Botanic Gardens.* Richmond, 48 pp.

MAPPA, 2007. Medicinal and Aromatic Plants Programme in Asia. http://www.mappa-asia.org/

Mulliken, T. & Inskipp, C. 2006. Medicinal plant conservation: scope, scale and diversity. *Proceeding of the 1st International Conference on Organic Wild Production*. IFOAM, Bonn, Germany, pp. 55–58.

Nekrošienė, R. 2001. Status and prospects of the collection of medicinal and spice plants at the Botanical garden of Klaipeda University. *Reports of the international scientific conference "Conditions and perspectives of applied sciences in the botanical gardens".* Vilnius, 2001, pp. 82-84.

Schippmann, U., Leaman, D. & Cunningham, A. 2006. Cultivation and wild collection of medicinal and aromatic plants under sustainability aspects. *Medicinal and Aromatic Plants*. Springer, Dordrecht, the Netherlands, pp. 23–45.

World Bank, 2004. Sustaining Forest: a Development Perspective. World Bank Publications, Washington, D.C., US.

SEED EXCHANGE IN BOTANICAL GARDEN OF ŠIAULIAI UNIVERSITY

A. Grišaitė, A. Klimienė, E. Lopetienė, A. Malciūtė, R. Vainorienė.
Botanical Garden of Šiauliai University
dir@bs.su.lt

ABSTRACT

One of the basic tasks of Botanical Garden of Šiauliai University is the fund accumulation of the plants seeds and the seed exchange. The first seed catalogue "*Index Seminum"* was published at 2002 and there 250 taxa and cultivars of the seeds were introduced. While prosecuting international seed exchange the closer and more intensive collaboration was made with botanical gardens, arboretums and other scientific institutions in various countries of the world. Therefore in the year 2009 Botanical garden prosecutes seed exchanges with 230 institutions. In the year 2008 we proposed 660 taxa and cultivars of the seeds for the seed exchanges.

Keywords: seed exchange, *Index Seminum*.

INTRODUCTION

The Botanical gardens of Lithuania including Šiauliai University Botanical garden are involved in the international programme of the seed exchange (Indrišiūnaitė et al., 2004; Baškienė et al., 2008; Goliakovienė et al., 2008; Grišaitė et al., 2008). Botanical gardens, arboretums and other scientific institutions according to this programme interchange of various seeds of the plants. For this purpose the catalogue „*Index Seminum"* is published annually.

The fundamental pattern of plant accumulation in the collection of Šiauliai University Botanical garden is the seed exchange. Therefore this programme of the exchange is particularly important to pursue the researches of accumulating plants of introducted and local growing places as the introduction of the plants is impossible without seed exchange.

The purpose of this work is to present information and initial results of the researches in the field of seed exchange prosecuted in Šiauliai University Botanical garden since the year 2002 to 2009.

RESULTS

The intensive expansion of the collections in Šiauliai University Botanical garden began since 2000. At that moment the new collections of the plants were started to create, later they enlarged and became sections. New sections of the plants were established, namely Plant Systematics and Geography, *Ericaceae* Family Plants, section of Rocky Mountain Plants, Phenological Garden. This rapid expansion of the collections was initiated by the sections of floriculture and dendrology. There are 482 taxa and cultivars of the plants included into the digest of the plants in Botanic garden in the year 2001. In the period of one year the collection of Botanical garden enlarged by 381 taxa. So 863 taxa were included into the digest of the plants growing in the garden in the year 2002.

In 2001 Botanic garden got 5 catalogues of the seeds (Fig.1). In 2002 the catalogue *„Index Seminum"* intended to seed exchange was formulated for the first time. 250 taxa and cultivars of the plants were included into this catalogue.

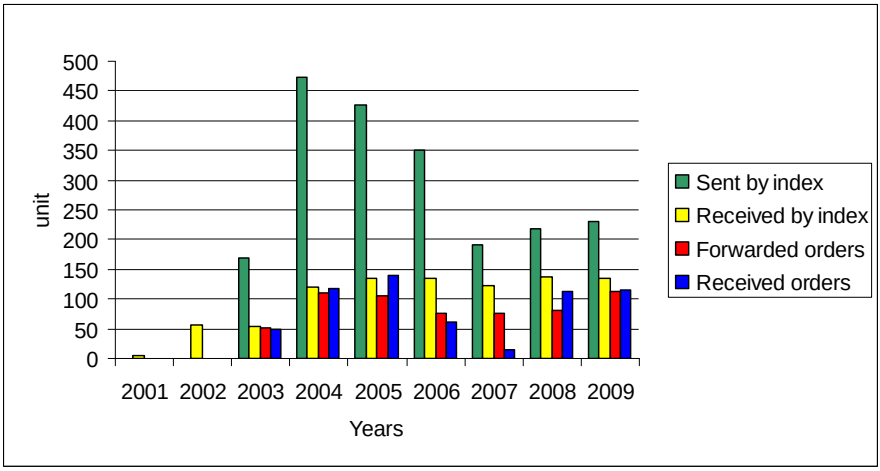


Fig.1.The changes of orders of the seeds and catalogues *Index Seminum* received/forwarded in 2001-2009.

The seed exchange particularly activated in the year 2004 when 474 catalogues of the seeds and 1119 packages of the seeds were forwarded and 119 catalogues and 1485 packages of the seeds were recieved from botanical gardens of various countries all over the world (Fig.2).

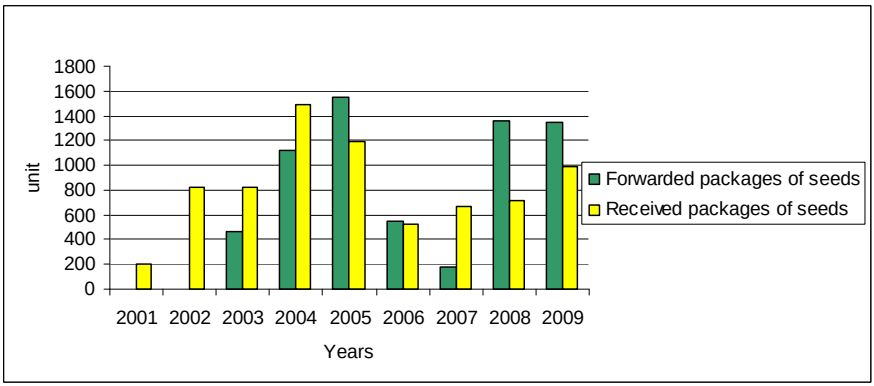


Fig.2. The changes of seed packages forwarded/received in 2001-2009.

660 taxa is included in the seed catalogue 2008. 28 taxa are ligneous, and the rest are herbaceous plants. The newest electronic version of this catalogue is in the internet site of Šiauliai University Botanical garden (www.sodas.su.lt).

Since 2003 seeds of plants from natural habits and seeds from J. Balvočiūtė ecological farm of medicinal plants are included into the catalogue of the seeds. Since 2007 the seeds of local rare and vanishing plants growing in Botanical garden are involved into the catalogue of the seeds. In 2008 some seeds of the plants listed in Red Data Book of Lithuania were proposed to the exchange, namely *Astrantia major* L., *Hydrocotyle vulgaris* L., *Laserpitium latifolium* L., *Aster tripolium* L., *Gnaphalium luteoalbum* L., *Pilosella echioides* (Lumn.) F.W.Schultz. et Sch.Bip., *Lunaria rediviva* L., *Campanula bononiensis* L., *Campanula cervicaria* L., *Dianthus arenarius* L., *Silene chlorantha* (Wild.) Ehrh., *Silene lithuanica* Zapal., *Scabiosa columbaria* L., *Vicia lathyroides* L., *Gentiana cruciata* L., *Hypericum hirsutum* L., *Hypericum humifusum* L., *Mentha longifolia* (L.) Huds., *Salvia pratensis* L., *Scutellaria hastifolia* L., *Stachys recta* L., *Androsace filiformis* Retz., *Cruciata glabra* (L.) Ehrend., *Viola elatior* Fr., *Allium angulosum* L., *Gladiolus imbricatus* L., *Sesleria caerulea* (L.) Ard.

While prosecuting international seed exchange it was noted that the most requested genus are these: *Adonis* L., *Campanula* L., *Dianthus* L., *Gentiana* L., *Heuchera* L., *Incarvillea* Juss., *Leontopodium* R. Br. ex Cass, *Primula* L., *Rhododendron* L., *Townsendia* Hook., *Saussurrea* DC. There was forwarded from 7 to 17 orders of some species of these genus.

The relation with botanical gardens is maintained in various world continents considering to geopraphical aspect. The basic relations are in Europe. We collaborate with 33 European countries, 8 countries of Asia, 2 of North America, one country of South America and one of Africa. We exchange of correspondence with 44 botanical gardens in Germany, 23 in Russia, 17 in Italy, 12 in Poland, etc. The close collaboration relates our Botanical garden

with some gardens of neighbouring countries, namely Poland, Belarus, Latvia, Estonia, Russia Kaliningrad.

Therefore the seed exchange is significant to botanical gardens because seeds are the initial planting matterial for the further works of plant introduction and acclimatization.

REFERENCES

Baškienė Ž., Lukšytė I., Maršelienė R., Miškūnaitė A., Stankevičienė K., Šabūnaitė J., Šeinauskienė E., Varkulevičienė J., Žeimavičius K., 2008. Index Seminum 2008 Hortus Botanicus Kaunensis Vytautas Magnus University. Kaunas.

Goliakovienė R., Baltaragienė K., Raudonienė L., Daubarienė E., Nekrošienė R., 2008. Index Seminum Anno 2008 Collectorum Hortus Botanicus Universitatis Klaipedensis. Klaipėda.

Grišaitė A., Klimienė A., Lopetienė E., Malciūtė A., Vainorienė R., 2008. Index Seminum 2008, No 8. Šiauliai.

Indrišiūnaitė G., Pribušauskaitė V., Žilinskaitė S., 2004. Seed exchange in Vilnius University Botanical Garden. Baltic Botanic Gardens in 2002-2003. Tartu, Estonia.

INTRODUCTIONAL RESEARCHES OF GREENHOUSE PLANTS IN KAUNAS BOTANICAL GARDEN OF VYTAUTAS MAGNUS UNIVERSITY IN LITHUANIA

Antanina Stankeviciene, Judita Varkuleviciene, Vilija Snieskiene.
Kaunas Botanical Garden Of Vytautas Magnus University
a.stankeviciene@bs.vdu.lt

ABSTRACT

The collections of ornamental plants in Kaunas Botanical Garden of Vytautas Magnus University make the constituent of the scientific investigative work and the object of the research (mycological, antifungal, fluorescence, genetic research et other), also there is rare plant collecting and reserving base. Plants are grown in six greenhouse sections by geographic-climatic principle. The data of taxonomical analysis estimated that 1253 species of ornamental plants belonging to 423 genera, 132 families, 14 subclasses, 8 classes, 62 ranges and to 4 divisions. It was identified 112 fungal species belonging to 37 genera, 8 families, 5 ranges, 3 class and 3 divisions.

Key words: greenhouse plants, taxonomical analysis, introductional research.

INTRODUCTION

Since 1923 collections of ornamental plants have been saved up and enlarged in Kaunas Botanical Garden of Vytautas Magnus University. Than the first Seeds Catalogue was issued, in which were entered 2146 plant species set for exchange. Till the twenties greenhouses were expended [5], there were grown 2218 exotic plant species [4]. In 2006 in six sections of the greenhouse were grown 1234 plant species [17]. Presently there are grown 1253 plant species. This collection is scientific, informational, educational and rare plant collecting and reserving base, directly concerned with the development of decorative gardening in Republic.

The aim of the work: describe the flora and mycobiota in the greenhouse of Kaunas Botanical Garden, give information about the made plant introduction researches.

MATERIALS ANT METHODS

The greenhouse of Kaunas Botanical Garden is of the area of 650 m^2 and is divided following taxonomical geographic-climatic principle. Dividing into sections: I section – for the tropical forest; II – for humid tropics; IV – for the

tropics; V – for cool subtropics; VI – for warm subtropics. There are researches: plants growing in greenhouse described according to the data of taxonomical analysis; rhizosphere mycological researches made guiding by common microbiological methods; made theoretical researches of antifungal activity of essential oil on pathogens; phytosanitarian state is being rated; genetic and fluorescence research; made to define plant fitting for various interiors etc.

RESULTS

The data of taxonomical analysis made in 2009 estimated that 1253 species of ornamental plants belonging to 423 genera, 132 families, 14 subclasses, 8 classes, 62 ranges and to 4 divisions (Table 1). The biggest number of genera and species was in the families: *Cactaceae* (48 genus, 180 species), *Araceae* (16, 49), *Arecaceae* (15, 27), *Crassulaceae* (15, 67), *Aizoaceae* (14, 32), *Bromeliaceae* (15, 56), *Agavaceae* (13, 95), *Acanthaceae* (11, 18).

Table 1. Main systematic groups of plants cultivated at the greenhouse of the Kaunas Botanical Garden (2009).

Division	Class	Number		
		Family	Genera	Species
Lycopodiophyta	*Lycopodiopsida*	1	1	3
Polypodiophyta	*Polypodiopsida*	11	17	44
Pinophyta	*Cycadopsida, Gingopsida, Pinopsida, Gnetopsida*	11	12	23
Magnoliophyta	*Magnoliopsida*	81	269	788
	Liliopsida	28	124	395
Total:	8	132	423	1253

In 2008 the collection of Kaunas Botanical Garden had the accession of *Wollemia nobilis*. These plants were discovered in 1994 in Australia and currently are referred to belong to the category of a critical risk (CR) plants (according to Red Book, 2000) [3].

Microscopic fungi functioning in the rhizosphere often are the cause of plant state declining, the loss of decorativeness ant even plant dying. From the year of 1997 are made greenhouse plant substratum mycological researches of separate systematic groups [8, 14, 15] and also the researches of main pathogens of greenhouse plants [10, 11, 13, 16]. Until this date finding data in a literature about fungi spreading in the rhizosphere of pot plants grown in Lithuania not succeeded. In 2006-2008 these research were summed up according to Stankeviciene & Lugauskas [12] (Table 2).

Table 2. Dominating microscopic fungi in the rhizosphere of greenhouse plants in Kaunas botanical Garden (Stankeviciene & Lugauskas, 2008)

Division	Class	Family	Number	
			Genus	Species
Ascomycota	*Ascomycetes*	*Arthrodermataceae*	1	1
		Gymnoascaceae	1	1
		Sclerotinaceae	1	1
		Chaetomiaceae	1	1
Oomycota	*Oomycetes*	*Pythiaceae*	1	2
Zygomycota	*Zygomycetes*	*Mortierellaceae*	1	7
		Mucoraceae	4	8
		Thamnidiaceae	1	1
		Mitosporic fungi	26	90

It was identified 112 fungal species belonging to 37 genera. 8 families, 5 ranges, 3 class ant 3 divisions functioning in the rhizosphere (systematize according to D.L Hawksworth et.al. [1]. The *Mitosporic fungi* have the largest of number of taxons, (90 species belonging to 26 genera). In all of plants' rhizosphere dominated fungi of the *Penicillium* genus (34 species) and less dominated in the rhizosphere of these 4 genera: *Aspergillus*, *Mucor*, *Mortierella* and *Acremonium* (by 6–8 species).

In Kaunas Botanical Garden are made theoretical researches of essential oil inhibition influence on pathogens isolated from pot plants [9]. In 2005 were started researches of the influence of environment conditions on plant growth and fluorescence researches, which had the object of *Marantaceae* family plants [6]. In 2008 the genetical researches of *Primulaceae* family plants were carried out.

According to suitability – these are plants characterized by decorativeness [18]. There are the educational means to introduce students, pupils and public with these plants. In Kaunas Botanical Garden were researched adaptation abilities of greenhouse plants in interior, the causes of loss of decorative appearance and causing factors and the growing suitability of the separate plant systematic groups in various interiors, adaptation flexibility [7, 19, 18].

In 2006 six scientists (two of them inquired into the theme of greenhouse plants) in order to improve the specialists preparation quality took part in the exchange project pf the EU Leonardo Da Vinci program "Quality improvement preparing the specialists of environment planting and land ordering stimulating the interest of development of the recreational and educational activity green plantations."

CONCLUSION

In Lithuania in Kaunas Botanical Garden in six greenhouse sections are grown 1253 plant species, belonging to 423 genus, 132 families, 14 subclasses, 8 classes, 62 ranges ant 4 divisions. Tropical and subtropical flora grown in greenhouse is scientific (mycological research, antifungal investigated, fluorescence and genetic researches et all), informational, educational and rare plant collecting and reserving base.

REFERENCES

Hawksworth D. L., Kirk P. M., Sutton B. C., Pegler D. N. Dictionary of the fungy. Cambridge, University Press, 1995. 616 p.

Juronis V., Snieskiene V., Stankeviciene A. The influence of some essential oils from micromycetes / Bulletin of the Polish Academy of Sciences, Biological Sciences, 2003; 51(3): 281–286.

Marinelli J. Plant. Dorling Kindersley, London, 2004, p. 159.

Meisneris K. Botanical Garden of Vytautas Magnus University. Kaunas, Varpas, 1936. 110 p. (in Lithanian)

Minkevičius A., Regelis K. Founder of Kaunas Botanical Garden (remembrance and facts). Kaunas, 2002. p. 9–20. (in Lithuanian).

Šlapakauskas V., Varkulevičienė J. Growth, Mycoflora and fluorescence of *Marantaceae* Petersen Plants, Conditioned by Surroudings of Hothouse / Vagos: Research papers, 2006; No 69(22), 1: 84–89. (in Lithuanian).

Snieskiene V., Juronis V., Stankeviciene A. The investigation of suitability of plants to various interiors / Visnyk of L'viv university, Biology Series. 2004; Is. 36: 344–349.

Snieškienė V., Stankevičienė A. Phytopathogenic Evaluation of *Dieffenbachia* grown in Kaunas Botanical Garden / Plant Genefund Accumulation, Evaluation and Protection in the Botanical gardens activity and development problems, Vilnius, 2004: 107–111. (in Lithuanian).

Snieskiene V., Stankeviciene A., Varkuleviciene J. The effect of the essential oils on micromycetes isolated from plants / Žemdirbystė. T. 95, Nr. 3 (2008). p. 447-452.

Stankeviciene A., Lugauskas A. Micromycetes of the *Fusarium* genus associate with pot-plants / Sodininkyste ir darzininkyste, 2003; 22(3): 222–229.

Stankeviciene A., Lugauskas A. Micromycetes of the *Pythium* genus associate with pot-plants / Botanica Lithuanica, 2003; 9(2): 185–189.

Stankevičienė A., Lugauskas A. Micromycete diversity in plants rhizosphere in diferent greenhouse sections / Scripta horti botanici Universitatis Vytauti Magni, 2008; T. 12: 84–93. (in Lithuanian).

Stankeviciene, A., Lugauskas A., Snieskiene V., Juronis V., Varkuleviciene J. *Verticillium* spp. in the rhizosphere of pot plants / Zeszyty Problemowe Postępów Nauk Rolniczych. Nowe patogeny roślin. Warszawa, 201–205.

Stankeviciene A., Snieskiene V. Juronis V. Micromycete Diversity in the Rhizosphere of the *Agavaceae* family Pot-Plants / Botanica Lithuanica, 2003; T. 9(2): 191–194.

Stankeviciene A., Snieskiene V., Lugauskas A. Micromycete isolated from rhizosphere *Ficus* genus plants / Botanica Lithuanica, 1999; Suppl. 3: 27–32.

Stankeviciene A., Varkuleviciene J. Pathogenic micromycete species functioning in the rhizosphere of sick pot-plants growing in peat substrate / Agronomy Research, 2006; 4 (Special issue): 393–396.

Varkulevičienė J., Ragažinskienė O., Stankevičienė A. Flora Tropical and Subtropical Zones in Greenhouse of Kaunas Botanical Garden of Vytautas Magnus University / Vagos: Research papers, 2006; Nr. 69(22), 1: 95-101. (in Lithuanian).

Varkulevičienė J., Stankevičienė A. *Dieffenbachia* Schott genus plants adaption abilities in interior / Materials of International Scientific Conference "Human and Nature safety", Kaunas, Akademija, 253–255 (in Lithuanian).

Varkulevičienė J., Stankevičienė A. Introduction and Research of *Bromeliaceae* family plants in Kaunas Botanical Garden / Lietuvos biologinė įvairovė: būklė, struktūra, apsauga, 2005; T. 1: 134–138. (in Lithuanian).

INTRODUCTION, CONSERVATION OF MEDICINAL PLANTS IN KAUNAS BOTANICAL GARDEN OF VYTAUTAS MAGNUS UNIVERSITY

Ona Ragažinskienė. Kaunas Botanical Garden of Vytautas Magnus University
o.ragazinskiene@bs.vdu.lt

Key words: medicinal plants, conservation, biologically active compounds, Lithuania

INTRODUCTION

Medicinal and aromatic plants are widely used for prophylaxis and treatment of diseases. The interest phytoterapic treatment is increasing worldwide (2, 4).

The diversity of plant species and varieties is important from the scientific and practical point of view. At the end of the 21th century, specific attention was paid to cultivation and preservation of medicinal and aromatic plants and to the evaluation of their quality (5). Production of many preparations of plant origin, immuno-stimulating among them, is limited by the deficiency of officinal herbal raw materials in Lithuania. It is important to increase the assortment of cultivated medicinal plants, to accumulate and study samples of the introduced plants in collections at present and in the future, thus preserving and enriching the genetic fund of useful plants of Lithuania (1, 9, 10, 12).

The collection of Medicinal and Spices (Aromatic), Melliferous Plants, the collection of Hops in the Kaunas Botanical Garden of Vytautas Magnus University is a scientific, education, information and genetic-fund basis for **researchers,** students, farmers and producers of medicinal and aromatic plants and other interested people.

The main objective of research is the medicinal plants introduced and conservated *ex situ* in the collection.

The main motivation aspects of the ongoing study are the following: biodiversity of plant resources, scarce information on biologically active compounds and their properties in many species, including those naturally growing in Lithuania or introduced, as well as increasing demand for natural food, food additives and homeopathic medicines.

CONDITIONS, MATERIALS AND METHODS

Kaunas Botanical Garden of Vytautas Magnus University is in the lowland part of Middle Lithuania, therefore the sea influence is low and there is some influence of continental climate. The following climatic data are typical for this region: average annual temperature is about + 6,7 °C, the annual cumulative temperature (S >10 °C) above + 10 °C is 2100 to 2300 °C, the average minimal monthly temperature in winter (T °n (m)) is – 24 to – 26 °C, and the annual precipitation is 500-750 mm. According to long period observations, the coldest month is January, the warmest one is July and the most rainy ones are July and August. 60 % of annual precipitation falls during the warm period (11). Plants are cultivated in gleyic cambisols (RDg), also in light and medium loamy soil normally supplied with nourishing substances.

Methods. Investigation was carried out in the collection of medicinal and in 6220 m^2 trial area at Kaunas Botanical Garden of Vytautas Magnus University, Kaunas, Middle Lithuania. The experimental areas were arranged according to a modified method (6, 7, 8). The phenological observations were performed during various periods of vegetation: beginning of vegetation, intense growth, pre-flowering, flowering initiation, massive), seed ripening, and end of vegetation [6, 8]. The content of essential oil was extracted using hydrodistillation (5). While their quality was determined employing the methods of gas chromatography and mass spectrometry on a high separation power capillary column.

Phytochemical analysis facilities at the Department of Biochemistry and biotechnology of Vytautas Magnus University include gas chromatography (GC), high efficiency liquid chromatography (HPLC), capillary chromatography and capillary electrophoresis (CE) (1, 10, 13).

Statistical analysis of the data was performed using programs Microsoft Excel and SPSS 9.0. In this study, a linear regression model has been analyzed. For the suitability of each regression model, determination coefficient r2 and p-value obtained by checking hypothesis on nonlinear regression were used. The strength of a linear relationship between variables was measured by Pearson's correlation coefficient r (3).

RESULTS

Introduction, Conservation *ex situ* of Medicinal plants in Kaunas Botanical Garden of Vytautas Magnus University**.** At present and in the future it is necessary to enrich the assortment of the cultivated medicinal and aromatic (spices) plants. For this purpose new species are being introduced. The introductory study of herbs was started by professor Kazys Grybauskas at the Kaunas Botanical Garden of Vytautas Magnus University in 1924 after the

foundation of the Department of Medicinal Plants there. It is very important to increase cultivation of medicinal plants in Lithuania because most of these plants serve also as potential genetic sources.

Research of medicinal plants, its directions and the designing of the collections have been changing according to the separate time stages. There are three noteworthy stages of scientific research: the first –1924–1949, the second – 1949–1984, and the third – 1984–2009. The materials of the research are the collections of medicinal plants. These collections have been changed during years: the location, size, numbers of species and varieties, classification and growing schemas vary in different periods.

The collections of medicinal plants have been and are object as well as part of research work.

For the moment the collections-expositions of medicinal plants contain 419 species, which belong to 290 genera and 90 families. Their classification is based on on bioactive compounds synthesized in plants (Fig 1). 26 species belongs to the category of protected and rather plants.

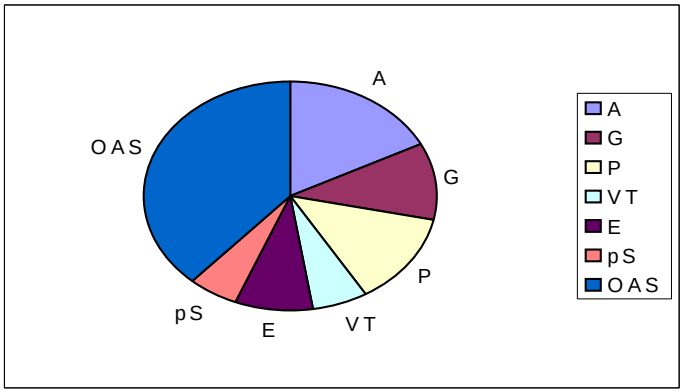


Fig 1. Percentage of species groups arranged according to their biologically active compounds:

A – plants accumulating alkaloids – 17,6 %; G – plants accumulating glycosides – 10,8 %; P – plants accumulating polyphenols – 13,0 %; VT – plants accumulating vitamins and tonic compounds – 6,0 %; E – plants accumulating essential oils – 8,8 %; PS – plants accumulating polysaccharides – 5,6 %; OAS – plants accumulating other active substances (38,2 %)

The collections-expositions of spices-melliferous plants contain 134 species, which belongs to 99 genera and 34 families.

The collection of hops contain 30 varieties, one hybrid and 19 wild individuals.

Research topic: Introduction and acclimatisation of medicinal and spices (aromatic) plants species and varieties, investigation of their diversity, protection and development of their genetic resources and chemical analysis.

The primary introductory study was carried out in the collections of medicinal plants. Perennial plants amount to 70 % from total number of plants, which are grown up in the collection biennial plants make up 5 %, annual – 12 %, perennial turned to wood climbing plants and trees come to about 2 %, under shrubs and bushes total to about 4 %. About 90 % medicinal plants grew intensively, under climatic conditions of Lithuania and they passed the whole development cycle successfully.

The research of medicinal plants performed in last years matches to the underlying direction of Lithuanian research and experimental development "The technologies of high quality, safe and ecological food", in the project "Functional ingredients and food supplements for food safety and quality". The work was carried outin the frame: of the National Programme on Plant Genetic Resources 2004– 2008 and the Lithuanian State Science and Studies Foundation projects „Quality improvement of raw material of medicinal plants using plant biotechnologies VAISTABIOTAS" (2007-2009) (Grant No. N-14/2007/ N-14/2008) and „Quantitative evaluation of flavonoids in raw material of *Scutellaria baicalensis* Georgi (2009).

CONCLUSIONS

90 % medicinal plants introduced and conservated *ex situ* in the collection of the Kaunas Botanical Garden at Vytautas Magnus University pass the whole development cycle successfully under climatic conditions of Middle Lithuania.

The introduction and acclimatization of new medicinal plants from various geographical regions, selecting most perspective species and varies, helps to protect *ex situ* genetic resources and biodiversity.

REFERENCES

Bimbiraitė K., Ragažinskienė O., Maruška A., Kornyšova O. Comparison of the chemical composition of four yarrow (Achillea millefolium L.) morphotypes // Biologija. 2008. Vol. 54. No. 3. P. 208–212.

Bisset N.G. and M. Wichtl (Ed.). Herbal Drugs and Phytopharmaceuticals Second Edition, CRC Press, Boca Raton-L.-N.Y.-W., 2001.

Čekanavičius V, Murauskas G. Statistika ir jos taikymas. (Use of statistics.) Vilnius: TEV; 2000.

ESCOP Monographs . The Scientific Foundation for Herbal Madicinal Products. United Kingdom, Germany, USA. 2003.

European Pharmacopoeia, Strasbourg. 2002 - 2008.

Методика исследований при интродукции лекарственных растений,. Лекарственное растениеводство, вып. 3, Москва, 1984: 33.

Miuleris J., Bluzmanas A. Augalų stebėjimų ir bandymų metodai. Vilnius, 1994: 128.

Ragažinskienė O., Lapinskienė N. M., Kornyšova O., Maruška A. Vaistinių augalų introdukcijos ir aklimatizacijos metodai // Jaunųjų mokslininkų darbai. 2008, nr. 3 (19): 72-75.

Ragažinskienė O., Rimkienė S. Medicinal and aromatic plants: genetic resources and cultivation in Lithuania. Journal of Medicinal & Spice Plants. 2003, 8(4): 189-191.

Stanius Ž., Obelevičius K., Kornyšova O., Maruška A., Ragažinskienė O. Capillary electrophoresis method for determination of bitter (α- and ß-) acids in *Humulus lupulus* L. Lithuanian varietes // Biologija, 2005; 3: 81-84.

Styra B. Lietuvos klimatas // Lietuvos TSR fizinė geografija. Vilnius, 1958: 167-206.

WHO guidelines on good agricultural and collection practices (GACP) for medicinal plants, World Health Organization, Geneva, 2003

Koleva I.I., Niederlander H.A.G., van Beek T.A., An on-line HPLC method for detection of radical scavenging compounds in complex mixtures, Anal. Chem., 2000; 72: 2323-2328.

HISTORY AND PRESENT OF KAUNAS BOTANICAL GARDEN

Aurimas Didžiokas, Ona Ragažinskienė, Kęstutis Žeimavičius, Laima Česonienė, Vilija Snieškienė, Judita Varkulevičienė. Kaunas Botanical Garden of Vytautas Magnus University
a.didziokas@bs.vdu.lt

Kaunas Botanical Garden was founded in 1923 as the centre of botanical sciences that belonged to Lithuanian (later Vytautas Magnus) University. Professor Konstantin Regel **(1890-1970)** from Tartu University was invited to guide this project. An internationally known botanist and scientist of high erudition, prof. K. Regel started the organization of the new Botanical Garden immediately and very professionally. With the help of other Botanical gardens, especially Berlin's Dahlem, Konigsberg and St. Petersburg's Kaunas Botanical Garden built up very rapidly. Not only the deep knowledge of botany but also the Regel's family tradition was helpful there – his grandfather Edward Regel headed the Royal Botanical Garden in St. Petersburg, and two of his uncles Arnold and Robert were also famous botanists. The Botanical Garden was granted the area of 74 hectares in a former estate of Joseph Godlewski on 15 February, 1923. The same year on 8 July, the Botanical Garden was sanctified and President Aleksandras Stulginskis placed the cornerstone for the Greenhouse. Building of the Greenhouse was one of the most important tasks for establishing Kaunas Botanical Garden. The construction ended only in 1938.

Prof. Konstantin Regel was the first director of the Botanical Garden from 1923 till 1940. He had visited numerous botanical gardens in Western European and was well informed about their structure and the gardening techniques used at that time. He used every possibility to transfer the best experience to Kaunas. A famous garden architect Karol Rauth from Hanover was invited to create a detailed planning project for the Botanical Garden. The former path system in the old park was modified. In 1923-1925, the first 4 chambers of the Greenhouse with controlled temperature and a tropical pool were constructed, implementing the project of a German company „*Höntech*". At the same time, under the supervision of a botanist Jurgis Kuprevičius, the dendropark consisting of the old estate park, the new arboretum as well as the section of plant taxonomy were established. The first catalogue for the seed exchange was published in 1924. The same year prof. Kazys Grybauskas returned from Russia and founded the Department of Medicinal Plants, which was later successfully extended. In the summer of 1925, the collections of Kaunas Botanical Garden were opened not only for individual visitors but also for the excursion groups.

In 1931 the first volume of the journal of the selected articles by the botanists of Kaunas Botanical Garden "*Scripta Horti Botanici Universitatis Vytauti Magni*" was published and disseminated among other Botanical gardens. At the same time the herbarium of Lithuanian flora "*Flora Exsiccata Lituana*" was started to be composed (a number of well preserved items have survived until now). The first issue (1933) was comprised of four books, describing 20 plants each. The herbarium was used for the exchange with foreign botanicsts.

An introductory collection of roses was initiated in 1925. However, the Rosarium was completely destroyed during the war. In 1957 dr. Ona Skeivienė prepared a project and the exposition of roses was restored. Much later, in 1975 a new Rosarium was established in the central part of the Botanical Garden, according to the project of a landscape architect Dainora Juchnevičiūtė.

The introduction of peonies was started in 1928. Some species were grown from seeds, received from various botanical gardens. 35 white flowered peony species were brought from Germany and France in 1933. A collection of peonies was enlarged by cultivars nurtured by Ona Skeivienė: 'Garbė Motinai', 'Profesorius K. Grybauskas', 'Virgilijus' and perspective hybrid seedlings. A collection of dahlias was founded in 1931. In 1938 a new Greenhouse for palms with two water pools for water plants was opened.

In 1940, when K. Regel had left Lithuania, prof. **Kazys Grybauskas (1886-1953)** became the director of the Botanical Garden. He directed Kaunas Botanical Garden from 1940 till 1952. He made every effort to save the garden during a difficult period of the war and also in the post-war years. During the World War II Kaunas Botanical Garden suffered from rather drastic losses. A part of the Greenhouse plants were lost, the collection of roses was destroyed, the number of ornamental plants decreased. Prof. K. Grybauskas managed to convince the representatives of German military command about the usefulness of medicinal plants for compensating the lack of medicines for the German army.

A new stage of the garden development was started after the war. The destroyed plant collections and expositions were re-established, and the new ones were started. A Nutritive-feed plant section was newly founded by Povilas Mikšionis in 1949. Pomology section was founded in 1951. This department was directed by Albinas Urbonas.

Marija Lukaitienė (1903-1975) was assigned to direct Kaunas Botanical Garden from 1952 till 1961. From 1929 she had studied lignified and herbaceous plants introduced in Lithuanian parks. In 1931-1932 the phenology of a number of local and introduced plants was observed in the Botanical Garden. In 1936 M. Lukaitienė visited German botanical gardens in Munich, Würzburg, Erfurt, and Berlin. She published many research papers and was a co-author of numerous books in the Lithuanian language: "Flora of

the Lithuanian SSR", "Decorative Gardening", etc. In the Botanical Garden, M. Lukaitienė started the studies on introduction of walnut trees. A collection of iris was planted in 1961. Numerous genus and species were collected so that the iris collection has been the largest in the Botanical Garden until now.

Dr. Algimantas Morkūnas (1927-1983) directed Kaunas Botanical Garden from 1961 till 1974. He wrote the book "New Oil Plants", and was a co-author of the book "Growing of Medicinal Plants" (in Lithuanian). Under his supervision Elena Radauskienė enlarged the collection of bulbous and monocotyledon plants. Plant introduction was continued and collections of tulips, lilies, ephemeral and other plants were extended.

Dr. Aloyzas-Ramunis Budriūnas directed Kaunas Botanical Garden from 1975 till 2000. In 1992 Kaunas Botanical Garden became a part of the re-established Vytautas Magnus University. A unique exposition for the blind and weak-eyed people was founded in 1997. Visitors can touch and smell medicinal, soft fruit, potherb plants; they can also read the names of the plants written in Braille and in enlarged print. With the consultations of an expert from the Botanical Institute Virginija Steponavičiene created an exposition of aquatic plants during 1999 – 2002. There are a few ponds full of aquatic plants in the Botanical Garden.

Dr. Remigijus Daubaras was the director of VDU Kaunas Botanical Garden from 2000 till 2008. The structure of Kaunas Botanical Garden was reorganized. Two PHARE projects (PHARE 2002 and PHARE 2003) were implemented by Kaunas Botanical Garden: *"The application of the facilities of Kaunas Botanical Garden to tourism purpose"*, and *"The development of ecological, scientific and cultural tourism in Kaunas Botanical Garden (arboretum)"*. The projects allowed to renovate partially the infrastructure of the Greenhouse and to extend a plant collection. In 2004, a collection of Lithuanian flowers was created to commemorate the famous Lithuanian florist Ona Skeivienė, who had exerted an extremely large input upon the Botanical Garden while she worked there from 1935 till 1978.

Prof. Vida Mildažienė was appointed to direct VMU Kaunas Botanical Garden in September 2008. She pursues to extend the functions of the Botanical Garden and make it more open for public education. Large collections of plants that are gathered in VDU Kaunas Botanical Garden are an invaluable treasure of Lithuania. The Botanical Garden together with its botanical expositions and collections, the Greenhouse, a big park and an interesting pond system have a big potential not only for plant research but also for all modern forms of interactive education, cultural tourism and community use.

Presently, VMU Kaunas Botanical Garden consists of five sectors: Medicinal plants, Dendrology, Pomology, Plants Pathology, Floriculture, and service subdivision. It occupies the area of 62.5 hectares. Approximately 7.000 different plants comprise the collections and expositions that are open for

public attendance and cover the area of about 30 ha. The number of visitors is 40.000 per year.

SECTOR OF MEDICINAL PLANTS

The research of medicinal plants at Kaunas Botanical Garden of University Vytautas Magnus started in 1924. The problems and topics of research changed during 84 years, however main original goals are still of high interest in our days. The main goal of medicinal plants research is to enrich local flora with new species and varieties, which can be used for pharmaceutical and food industry. The introduction and acclimatization of new medicinal and aromatic plants from various geographical regions, selecting most perspective species and varies, helps to protect genetic resources and biodiversity. Investigation of medicinal plants properties is very important in the preparation of recommendations for medicinal plants producers and in the formulation of new concepts for growing and analysis of medicinal plants.

These collections have been changed during years: the location, size, number of species and varieties, classification and growing schemas vary in different periods.

For the moment the collections-expositions of medicinal plants contain 419 species, which belong to 290 genera and 90 families. Their classification is based on on bioactive compounds synthesized in plants. 26 species belongs to the category of protected and rather plants. The collections-expositions of spices-melliferous plants contain 134 species, which belongs to 99 genera and 34 families. The collection of hops contain 30 varieties, one hybrid and 19 wild individuals.

Research topic: Introduction and acclimatisation of medicinal and spices (aromatic) plants species and varieties, investigation of their diversity, protection and development of their genetic resources in Central Lithuania.

Objects: Humulus lupulus L. varieties, Nigella damascena L., Nigella sativa L., Achillea millefolium L., Angelica archangelica L., Geranium macrorrhizum L., Potentilla fruticosa L., Epilobium angustifolium L., Origanum vulgare L., Lavandula angustifolia Mill., Hyssopus officinalis L., Leonurus cardiaca L., Echinacea purpurea (L.) Moench, Echinacea pallida (Nutt.) Nutt, Perilla frutescens (L.) Britton, Schisandra chinensis (Turcz.) Baill., Rhaponticum carthamoides (DC.) Iljin, Scutellaria baicalensis Georgi, Viola tricolor L., Chamaemelum nobile (L.) All. = Anthemis nobilis L., Melissa officinalis L., Mentha piperita L.

The collections-expositions are part of Lithuanian national gene fond and education base for students, PhD students and herbal professionals.

SECTOR OF DENDROLOGY

The direction of scientific research works of dendrology sector are investigations of the introduction, acclimatization and genetic resource of woody plants. Scientific work has been carried out in collections, which are accumulated not only in the arboretum, but also in the arboretum of introduction and in the park of an old landscape style, which was announced protected in 1958, and in 1986 was on attachment to monuments of republican meaning. There are in the central part of arboretum extant plants such as ginkgo (*Ginkgo biloba*), katsura tree (*Cercidiphyllum japonicum*), silver maple (*Acer saccharinum*), grey poplar (*Populus x canescens*), dawn redwood (*Metasequoia glyptostroboides*) and black pine (*Pinus nigra*), which were planted at the establishing time. There were 450 species and forms of exotic woody plants in the seventh decade in the botanical garden, when M. Lukaitienė was directed. V. Ivanauskas, dr. M. Navasaitis, dr. L. Januškevičius, dr. V. Baronienė, D. Liagienė were accumulated collection to latter-day. In 2000, dendrological collection was given protected object status. Dr. K. Žeimavičius head of department from 2005. More then 800 species, subspecies, varieties, forms, cultivars of woody introduced plants were in the collection in 2008, between them are growing: 250 – gymnospermous and near to 600 – angiospermous species. 6 species and 12 cultivars of plants were obtained in 2006–2008. The richest collections are of *Cupressaceae, Pinacea*, *Oleaceae*, *Ericaceae*, *Rosaceae*, *Hydrangeaceae* and *Aceraceae* families. Colourful Lawson cypress (*Chamaecyparis lawsoniana*), different cultivars of American arbor-vitae (*Thuja*), flowery rhododendrons (*Rhododendron*), heaths (*Calluna*), and the riches collection in the Baltic countries and Scandinavia of shrubby cinquefoil (*Potentilla fruticosa*) may be visited in the arboretum. Visitors have been interested in rare and decorative plants as Korean fir (*Abies coreana*), Japonese cedar (*Cryptomeria japonica*) 'Elegans', junipers (*Juniperus*) with blue-green foliage, Indian abelia (*Abelia trifoliata*), star magnolia (*Magnolia*) 'Susan' and 'Nigra' and box-elder maple (*Acer negundo*) 'Flamingo'.

The most promising plants - one cultivar of American arbor-vitae (*Thuja occidentalis*), 2 species and 4 cultivars of spindle tree (*Euonymus*), 13 cultivars of cinquefoil shrubby (*Potentilla fruticosa*) and 3 species and 5 cultivars of spiraea (*Spireae*) are selected for investigation and preservation. This work is done by participating in program "Accumulation, preservation and investigation of the gene pool of decorative plants in Lithuania" in project:" Accumulation, preservation and investigation of the gene pool of decorative plants".

There are six species cultured in the dendrology collection of VMU Kaunas botanical garden – one of gymnospermous and 5 of angiospermous of 12 species of woody plants of the Red book of Lithuania.

SECTOR OF POMOLOGY

Development of horticultural plant collection and their research was started in Kaunas Botanical Garden of Vytautas Magnus University in 1923, immediately after its foundation. Walnuts, grapes and apricots have been investigated in the department of Pomology since 1951. Continuing long term traditions, since 1993 introduction and acclimatization of new perspective berry plants has been performed in Kaunas Botanical Garden. Considerable collections of blueberry *Vaccinium x covileamum* Butkus et Plizka, American cranberry *Oxycoccus macrocarpus* (Aiton) Pursh, actinidia *Actinidia* Lindl., European cranberry bush *Viburnum opulus* L. were established. The unique collection of European cranberry *Oxycoccus palustris* Pers. with over 110 clones was collected during the expeditions to strictly protested areas as well as Ignalina, Utena and Jurbarkas regions bogs in 1995-2000.

64 species and clones of highbush blueberry, obtained from various institutions in USA, Germany, Poland, Latvia and Sweden are investigated in Kaunas Botanical Garden of VMU. Scientific research work is performed evaluating biochemical composition of berries, reproduction peculiarities and determining adaptation potential of highbush blueberry species to the climate conditions in Lithuania.

53 species and clones of American cranberry are investigated. Genetic diversity, biological and economical productivity are assessed, perspective cultivars are selected for their cultivation in industrial plantations in Lithuania.

The collection of actinidia genus is comprised of 76 species, cultivars and clones. The performed research includes the evaluation of genetic and phenotypic diversity, research of biologically active substances in kolomikta kiwi (*Actinidia kolomikta* (Maxim.) Maxim.) berries. Valuable clones of cowberry *Vaccinium vitis-idaea* L., European cranberry bush *Viburnum opulus* L., hazelnut *Corylus avellana* L., arctic bramble *Rubus arcticus* L. are selected and investigated in berry plant collection. In their research, scientists of pomology group use classical morphological diversity and productivity evaluation methods and also apply modern genetic, molecular biology and biochemistry research methods.

The results of berry plant introduction research are as follows: optimal conditions of reproduction and cultivation of these plants are determined, the most perspective cultivars of highbush blueberry, American cranberry and kolomikta kiwi are selected for cultivation in Lithuania, and recommendations are prepared for farmers interested in alternative farming possibilities with regard of cultivating these plants and using their berries. Seminars and scientific conferences are organized continually. Kaunas

Botanical Garden of VMU cooperates with various Lithuanian scientific institutions. Botanical Gardens of Estonia, Byelorussia, Poland as well as Horticulture and Floriculture Institute in Skierniewice (Poland), proficients of berry plant cultivation and owners of plantations in Poland, Germany, Sweden and Canada.

SECTOR OF PLANT PATHOLOGY

The thematic group of plant pathology has settled from plant protection group, which was formed in 1960. At different times pathologist have belonged to different Botanical garden structures.

The problems of plant pathology in Botanical garden was started to tackle at pre-war years. The main task for pathology group – to investigated variety of pathogenic (injurious) organisms, their migration ways and interaction with introduced (imported) plants. Common mission of this activity – support the work of plant introduction in Botanical garden. Considerable matters under investigation also are the questions concerned with practical introduced plant protection against injurants.

Among the subjects of scientific work of these days dominates the variety research of foreign land plant diseases and injurants, their destructiveness and means against them. Attention is also paid for city green plantation for which the protection is very important.

SECTOR OF FLORICULTURE

Since the foundation of the Botanical Garden a special attention is paid to expositions and collections of ornamental plants. Flowerbeds were being planted; collections of ornamental plants were being collected. During the World War II almost all this treasure was ruined.

Department of expositions and collections, is in the central part of Botanical Garden covering the area of 2.5 ha. The main direction of researches is acclimatisation of introduced ornamental plants, accumulation, evaluation and preservation of Lithuanian cultivars and hybrids genofond (genetic reservoir) in Kaunas Botanical Garden.

There are about 3800 taxons of ornamental perennial plants grown in expositions and collections of lignified and herbaceous ornamental plants in central part of Botanical Garden.

A unique Flora taxonomy plants collection, which widens view in sphere of plant taxonomy as well as enables to see species very rare in nature, belongs to this department. Collection of Flora taxonomy consists of 85 families and more than 800 taxons of local flora and introduced plants are displayed in

taxonomical order. A big collection of bulbous and other monocolydenous plants species and sorts is grown in pond island.

Collections of various flowers cultivars and hybrids are gathered in department of expositions and collections: dahlias – 276 taxons, peonies – 185; iris – 196; astilbes – 53; lilies – 112; day lilies – 114; tulips – 507; roses – 350; other perennial flowers – over 814 taxons.

The aim of Botanical Garden seed exchanges is to uphold consistent and reach out for new contacts with Botanical Gardens all over the world, as well as other scientific instances in order to carry out seed and plant exchange with them. Seeds and plants exchange is the first stage of plant introduction – richness and variability of collections depends on it. Catalogue of seed exchange "Index seminum" is being published since the foundation of the garden. Currently Botanical Garden parries out seed exchanges with 323 addressees. We receive nearly 1000 seed names and live plants from other Botanical Gardens. We send more than 800 names of plants seeds to other Botanical Gardens.

Fundamental and engineering researches of botanical science are being developed, plant herbal belonging to regional and national herbal collection is being gathered and researched in Botanical Garden. Nearly 10.000 herbarized plants samples are gathered and preserved in Botanical Garden.

VDU Kaunas Botanical Garden greenhouse of tropical plants was started to build in 1923 and finished in 1938. Some of the plants were received not only from abroad but also from Lithuanian estates greenhouses: Zagare, Rietavas, Kretinga.

Plants are grown in 6 sections of greenhouse according to geographical-climatic principle: **I** section – tropical forests; **II** – rainforests; **III** – dry tropics; **IV** – tropics; **V** – cool subtropics; **VI** – warm subtropics.

Greenhouse plants are located according to their needs for temperature and humidity level. There are two main climatic mode types: tropical (temperature during winter is 18-25°C) and subtropical (temperature during winter is 6-15°C). In both modes plants are grouped into groups according to their geographical origin.

Greenhouse plants exposition covers area of 665 m^2. There are grown tropical and subtropical plants of 1500 species, cultivars and forms. Among them there are plants, which originate from some South America and Malaysia rainforests, Southeast Asia monsoon forests, dry African savannah and well known Mexican deserts.

Many of them are edible or potherb plants (banana, pineapple, vanilla, cardamon, ginger), others are valued for industrial material (agaves, gravillea, etc.); others are widely used for medicinal purposes (aloe, efedra, pelargonium, passiflora).

5 cultivars (‘Jadvyga‘, 'Linkėjimai Latvijai', 'Lietuvaitė', 'Jaunystė' and 'Pasaka') of Primula *malacoides* Franch. were created and legalized in VDU Kaunas Botanical Garden in1967-1976. Originator – Ona Skeivienė. These cultivars are original, flowers abundantly, are ornamental, having delicate scent. They are well grown; works of seedage and selection are carried out annually.